Economic Impacts Associated with Potential Critical Habitat Designation for the Leatherback Sea Turtle

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EXECUTIVE SUMMARY

Introduction

The purpose of this report is to identify and analyze the potential economic impacts associated with the designation of critical habitat for the leatherback sea turtle (hereafter, "leatherback"). The analysis examines the potential impacts of restricting or modifying specific water and land uses to avoid adverse modification or destruction of critical habitat.

Approach

This analysis examines the state of the world with and without the designation of critical habitat for leatherbacks. The "without critical habitat" scenario represents the baseline for the analysis, considering habitat protections already afforded leatherbacks under its Federal listing and under other Federal, State, and local regulations, including protections afforded leatherbacks from other listed species, such as green sturgeon, West Coast salmon and steelhead, delta smelt, and marine mammal species, and their designated critical habitat. The "with critical habitat" scenario attempts to describe the incremental impacts associated specifically with the designation of critical habitat for leatherbacks. This analysis does provide an overview of costs that may be considered coextensive with the listing of leatherbacks and other baseline protections. The focus of the analysis, however, is determining the incremental costs, attributable to critical habitat designation of leatherbacks.

To quantify the economic impacts of modifications to water and land uses that result from critical habitat designation, the analysis employs the following five steps:

- Define the geographic area for the analysis and identify the specific areas to be analyzed for purposes of this designation. The biological report to designate leatherback critical habitat analyzes how each of these areas meets the definition of critical habitat set forth in Section 3 of the Endangered Species Act (ESA).
- Identify physical and biological features and the primary constituent elements (hereafter "PCEs") and economic activities that may have an impact on the PCEs. Impacts to PCEs will have impacts to the physical and biological features essential for conservation.
- Estimate the baseline level of protection afforded leatherbacks by area and activity type.
- For each economic activity, establish the existing and expected level of economic activity that may be affected by leatherback conservation efforts in each critical habitat area.
- Estimate potential economic impacts of leatherback conservation efforts by economic activity type and sum these impacts by area.

These steps are described in greater detail in Section 1.

Results

Eight categories of economic activities were identified as being potentially affected by the proposed designation of leatherback critical habitat. Because a large degree of uncertainty exists with regard to future actions likely to be undertaken specifically for the conservation of leatherbacks and their habitat as a result of these identified activities, this analysis presents a range of possible impacts. This range is based on low-end and high-end impact scenarios developed for six activities: NPDES facilities, agricultural pesticide applications, oil spills, power plants, desalination plants and tidal/wave energy projects. These scenarios are discussed further in Section 2. Also, Section 2 of the analysis describes two activity categories for which data limitations precluded a quantitative assessment of economic effects, including liquefied natural gas terminals and aquaculture facilities.

The annualized impacts by area are presented below in table ES-1 for both low and high scenarios and showing a midpoint. In the low-end scenario, annualized impacts by area vary from $25,100 to $1.6 million (discounted at seven percent). In the high end scenario, annualized impacts by area vary from $68,200 to $12.0 million (discounted at seven percent). In both scenarios Area 7, which is the only area to have all 8 activity types present, incurs the highest impacts. Areas 4, 5 and 6 have the lowest impacts, since the only activity identified in these areas is the possibility of an oil spill.

Table ES-1: Summary of Annualized Impacts by Area by Rank (highest to lowest impacts)

Area	Annualized Impacts (7% Discount Rate)			Activities with only a qualitative analysis
	Low	Mid	High	
7	$1,646,600	$6,820,450	$11,994,300	LNG and Aquaculture
1	$874,700	$3,581,850	$6,289,000	
3	$648,100	$2,739,800	$4,831,500	LNG
2	$530,100	$1,345,950	$2,161,800	LNG
8	$25,100	$46,650	$68,200	LNG and Aquaculture
4	$25,100	$46,650	$68,200	
5	$25,100	$46,650	$68,200	
6	$25,100	$46,650	$68,200	
Total	$3,799,900	$14,674,650	$25,549,400	LNG and Aquaculture

* Note: Section 2 of the report present results of the analysis in more detail.

SECTION 1: FRAMEWORK FOR THE ANALYSIS

1.1 Introduction

The purpose of this report is to identify and analyze the potential economic impacts associated with the designation of critical habitat for the leatherback. The analysis examines the potential impacts of restricting or modifying specific water and land uses to avoid adverse modification or destruction of critical habitat. This chapter presents the framework applied to analyze the economic impacts of critical habitat designation.

1.2 General Framework for the Economic Analysis

Similar to its analysis of critical habitat designation for West Coast salmon and steelhead and Southern Distinct Population Segment (DPS) of North American green sturgeon, National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) is applying a cost-effectiveness framework to analyze the designation of critical habitat for leatherbacks. This framework supports the section 4(b)(2) decision-making process by allowing NMFS to compare an estimate of the "benefits of exclusion" against an indicator of the biological "benefits of designation" for any particular area.[1] For this analysis, the cost-effectiveness framework has been modified, given the general uncertainty about specific management actions likely to be undertaken. This economic analysis addresses the "benefits of exclusion" portion of the weighing process, while the Biological Report and the ESA section 4(b)(2) Report address and compare our results to the "benefits of designation" for each particular area considered. These other reports also present more detailed information regarding presence of leatherbacks and identified PCEs in areas under consideration for critical habitat designation.

Note: information, where appropriate, was taken from the "Economic Analysis of the Impacts of Designating Critical Habitat for the Threatened Southern Distinct Population Segment of North American Green Sturgeon (2008), prepared by Industrial Economics, Inc. for NMFS. Also, information, where appropriate, was taken from the "Final Economic Analysis of Critical Habitat Designation for Seven West Coast Salmon and Steelhead ESUs (2005)," prepared by NMFS.

[1] National Marine Fisheries Service (NMFS). *Final Economic Analysis of Critical Habitat Designation for 12 West Coast Salmon and Steelhead ESUs*. August 2005. Section 1.2.1 of this report is a reduced form of the framework discussion provided in the West Coast salmon critical habitat analysis by the Northwest Fisheries Science Center.

1.2.1 Benefit-Cost Analysis and Cost-Effectiveness Analysis

When economic activities have biological effects or other consequences for conservation, analyses of the impacts of regulating those activities can take a number of approaches. Two possible approaches are benefit-cost analysis and cost-effectiveness analysis. Each of these approaches has strong scientific support as well as support from the Office of Management and Budget (OMB) through its guidelines on regulatory analysis.[2] Each also has well known drawbacks, both theoretical and practical, as discussed in the following section in the context of critical habitat designation.

Benefit-cost analysis (BCA) is the first choice for analyzing the consequences of a regulatory action such as critical habitat designation.[3] BCA is a well-established procedure for assessing the "best" course or scale of action, where "best" is that course which maximizes net benefits.[4] Because BCA assesses the value of an activity in net benefit terms, it requires that a single metric, most commonly dollars, be used to gauge both benefits and costs. Although the data and economic models necessary to estimate costs may be difficult or costly to gather and develop, expressing costs in dollars is straightforward for most regulatory actions. This is often the case for critical habitat designation, which has direct impacts on activities carried out, funded, or permitted by the Federal government. However, as discussed below, a large degree of uncertainty exists with regard to potential economic impacts of critical habitat designation for the leatherbacks. (Conceptually, the “benefits of exclusion,” which is the language used in section 4(b)(2) of the Endangered Species Act (ESA), are identical to the “costs of designation,” and so estimates of these costs could be used in a benefit-cost framework.)

Assessing the benefits of critical habitat designation in a BCA framework is straightforward in principle but much more difficult in practice. To the extent that the critical habitat provisions of the ESA increase the protections afforded the leatherbacks and their habitat, they produce real benefits to the species. In principle, these benefits can be measured first by a biological metric, and then by a dollar metric. A biological metric could take the form of the expected decrease in extinction risk, increase in the annual population growth rate, and so forth. A BCA would then use this metric to assess the state of the species with and without critical habitat designation. This assessment would reveal the biological impact of designation, quantified in terms of the metric. However, the available data are insufficient to quantify the benefits of designating critical habitat for leatherbacks, particularly with respect to discrete geographical areas.

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[2] U.S. Office of Management and Budget. “Circular A-4,” September 17, 2003, available at http://www.whitehouse.gov/omb/circulars/a004/a-4.pdf.
[3] Ibid.
[4] Zerbe, R., and D. Dively, 1994. Benefit Cost Analysis in Theory and Practice, New York: HarperCollins.

Recognizing the difficulty of estimating economic values in cases like this one, OMB has recently acknowledged cost-effectiveness analysis (CEA) as an appropriate alternative to BCA:

> Cost-effectiveness analysis can provide a rigorous way to identify options that achieve the most effective use of the resources available without requiring monetization of all of the relevant benefits or costs. Generally, cost-effectiveness analysis is designed to compare a set of regulatory actions with the same primary outcome (e.g., an increase in the acres of wetlands protected) or multiple outcomes that can be integrated into a single numerical index (e.g., units of health improvement).[5]

Ideally, CEA quantifies both the benefits and costs of a regulatory action but uses different metrics for each. A common application of this method is to health care strategies, where the benefits of a strategy are quantified in terms of lives saved, additional years of survival, or some other quantitative, health-related measure.

In principle, conducting a CEA of critical habitat designation proceeds along the same lines identified above for BCA, except that the last step of assigning economic (dollar) values to biological benefits is not taken. Different configurations of critical habitat could be gauged by both metrics, with the cost-effectiveness (ratio of units of biological benefits to monetized cost) evaluated in each case. If alternatives have the same level of biological benefits, the most cost-effective is the one with the highest ratio of biological benefits to cost (either in the form of monetized costs or some other cost metric or cost ranking).

Standard CEA presumes that benefits and costs can be measured with a cardinal or even continuous measure. For critical habitat designations in general, however, constructing such a measure for biological benefits is problematic. Although protecting habitat for leatherbacks is likely to have benefits, it is not yet possible to quantify the benefits reliably with a single biological metric given the state of the science. In addition, there is general uncertainty about specific management actions likely to be undertaken on behalf of this species. Thus, applying CEA in its standard form is not possible.

The alternative form of CEA being applied to the leatherback analysis is one that develops an ordinal measure of the benefits of critical habitat designation. Although it is difficult to monetize or quantify benefits of critical habitat designation, it is possible to differentiate among habitat areas based on their estimated relative need for special management. For example, habitat areas can be rated as having a high,

[5] Ibid.

medium, or low biological value. The output (a qualitative ordinal ranking) may better reflect the state of the science for the geographic scale considered here than a quantified output, and can be done with available information.

Individual habitat areas can be assessed using both their biological evaluation and economic impact assessments, so that areas with high conservation value and lower economic impacts have a higher priority for designation, and areas with a low conservation value and higher economic impacts have a higher priority for exclusion. Again, these analyses are discussed in the Biological Report and the ESA section 4(b)(2) report for this rule.

By proceeding in order of these priorities (either in terms of designation or exclusion), the proposed critical habitat will minimize, or at least (in practice) reduce, the overall economic cost of achieving any given level of conservation. This form of CEA has two limitations, one of which it shares with the standard form of CEA. First, because CEA does not evaluate benefits and costs in the same metric, the analysis cannot assess whether a given change has benefits that, in monetary terms, are greater than costs. Although this analysis arrives at estimated economic impacts on a cost per area basis, a large degree of uncertainty exists with regard to these costs. However, because the biological values are classified into high, medium, and low values, the coarseness of the available cost information should suffice to produce an effective tool for balancing costs and benefits. A second limitation of the modified form of CEA is the inability to discern variation in benefits among those areas assigned the same conservation value (i.e., the same ordinal ranking). A likely outcome is that using the modified CEA will lead to an outcome with higher expected costs of achieving any given level of conservation than one produced with standard CEA or BCA. This limitation, however, should be compared to the greater feasibility of the modified CEA.

1.3 Impacts that are the Focus of this Analysis

This analysis examines the state of the world with and without the designation of critical habitat for the leatherback. The "without critical habitat" scenario represents the baseline for the analysis, considering habitat protections already afforded leatherbacks under its Federal listing and under other Federal, State, and local regulations, including protections afforded leatherbacks resulting from protections afforded other listed species, such as West Coast salmon and steelhead, delta smelt, green sturgeon and marine mammals. The "with critical habitat" scenario attempts to describe the incremental impacts associated

specifically with the proposed designation of critical habitat for the leatherbacks.[6] This analysis does provide an overview of costs that may be considered coextensive with the listing of leatherbacks and other baseline protections. The focus of the analysis, however, is determining the increment of costs that is attributable to critical habitat.

The social welfare impacts of critical habitat designation generally reflect "opportunity costs" associated with the commitment of resources required to accomplish species and habitat conservation. For example, if a set of activities that may take place on a parcel of land are limited as a result of the designation or the presence of the species, and thus the market value of that land is reduced, this reduction in value represents one measure of opportunity cost. Similarly, the costs incurred by a Federal action agency to consult with NMFS under section 7 represent opportunity costs related to leatherback conservation, as the time and effort associated with those consultations would have been spent on other endeavors absent the listing of the species or critical habitat designation.

At the guidance of the Office of Management and Budget (OMB) and in compliance with Executive Order 12866, "Regulatory Planning and Review," Federal agencies measure changes in economic efficiency in order to understand how society, as a whole, will be affected by a regulatory action. Economists generally characterize opportunity costs in terms of changes in producer and consumer surpluses (i.e., social welfare impacts) in affected markets.[7]

1.3.1 Baseline for the Economic Analysis

The first step in the economic analysis is to identify the baseline level of protection afforded the leatherbacks and their habitat. This section provides a description of the methodology used to identify baseline conditions and incremental impacts stemming from the proposed designation of critical habitat for the leatherbacks.

[6] We note that although the focus of this analysis is on the incremental effects of the designating critical habitat, due to uncertainties with regard to future management actions associated with leatherback critical habitat, it was difficult in some cases to exclude potential impacts that may already occur under the baseline. Thus, the analysis may include some costs which would have occurred under the baseline regardless of designating critical habitat.

[7] For additional information on the definition of "surplus" and an explanation of consumer and producer surplus in the context of regulatory analysis, see: Gramlich, Edward M. *A Guide to Benefit-Cost Analysis (2nd Ed.).* Prospect Heights, Illinois: Waveland Press, Inc., 1990; and U.S. Environmental Protection Agency, "Guidelines for Preparing Economic Analyses," EPA 240-R-00-003, September 2000, available at http://yosemite.epa.gov/ee/epa/eed.nsf/webpages/Guidelines.html.

The baseline for this analysis is the existing state of regulation prior to the designation of critical habitat that provides protection to the species under the ESA and other Federal, State and local laws and regulations. The baseline includes the protections of sections 7, 9, and 10 of the ESA, and economic impacts resulting from these protections to the extent that they are expected to occur absent the designation of critical habitat for the species.

Section 7 of the Act, absent critical habitat designation, requires Federal agencies to consult with NMFS to ensure that any action authorized, funded, or carried out will not likely jeopardize the continued existence of any endangered or threatened species. The portion of the administrative costs of consultations under the jeopardy standard, along with the impacts of project modifications resulting from consideration of this standard, are considered baseline impacts.

Section 9 of the ESA defines the actions that are prohibited by the Act. In particular, it prohibits the "take" of endangered wildlife, where "take" means to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."[8] The economic impacts associated with this section manifest themselves in sections 7 and 10.

The protection of listed species and habitat is not limited to the Act. Other Federal agencies, as well as State and local governments, may also seek to protect the natural resources under their jurisdiction. If compliance with the Clean Water Act or State environmental quality laws, for example, protects habitat for the species, such protective efforts are considered to be baseline protections and costs associated with these efforts are not quantified as impacts of critical habitat designation. As noted above, where uncertainty exists as to whether particular costs would have already occurred under the baseline, this analysis conservatively includes those costs. Many of the relevant existing regulations are discussed in Appendix B.

1.3.2 Types of Economic Impacts of Critical Habitat Designation

This analysis focuses on the incremental impacts of the proposed critical habitat designation. The purpose of the analysis is to determine the impacts on water and land uses from the proposed designation of critical habitat that are above and beyond those impacts due to existing or planned conservation efforts being undertaken due to other Federal, State, and local regulations or guidelines.

[8] 16 U.S.C. 1532.

When critical habitat is designated, section 7 of the ESA requires Federal agencies to ensure that their actions will not result in the destruction or adverse modification of critical habitat (in addition to ensuring that the actions are not likely to jeopardize the continued existence of the species). The added administrative costs of including consideration of critical habitat in section 7 consultations and the additional impacts of implementing project modifications to protect critical habitat are the direct result of the designation of critical habitat. These costs are not in the baseline, and are considered incremental economic impacts of the rulemaking.

Incremental impacts may include the direct costs associated with additional effort for future consultations, reinitiated consultations, and new consultations occurring specifically because of the designation, and additional project modifications that would not have been otherwise required to avoid jeopardizing the continued existence of the species. Additionally, incremental impacts may include indirect impacts resulting from reaction to the potential designation of critical habitat, triggering of additional requirements under. State or local laws intended to protect sensitive habitat, and uncertainty and perceptional effects on markets. The nature of these impacts is described in greater detail below.

Direct Impacts

The direct incremental impacts of critical habitat designation stem from the consideration of the potential for destruction or adverse modification of critical habitat during section 7 consultations. The two categories of direct incremental impacts of critical habitat designation are: 1) the administrative costs of conducting section 7 consultations; and 2) implementation of any project modifications requested by NMFS through section 7 consultation to avoid destruction or adverse modification of critical habitat.

Administrative Section 7 Consultation Costs

Parties involved in section 7 consultations for leatherbacks include NMFS, a Federal action agency (the Federal action, such as a permit or other authorization, provides the "Federal nexus" requiring consultation), and in some cases, a private entity involved in the project or activity. NMFS could also serve as the Federal action agency, in which case the consultation would be conducted internally between regions, divisions, or offices. While consultations are required for activities that involve a Federal nexus and may affect the species, regardless of whether critical habitat is designated, the designation may increase the effort for consultations where the project or activity in question may adversely modify critical habitat. Administrative efforts for consultation may therefore result in both baseline and incremental impacts.

The geographic scope of the leatherback critical habitat being considered and the nature of the available data preclude unit-by-unit accounting of these costs. First, a single consultation can cover more than one project. While the majority of consultations cover a single project, the exceptions are important. For example, programmatic consultations determine how a type or types of project, not the projects themselves, can be modified to ensure they comply with section 7. As a result, these consultations can cover large numbers of projects. While programmatic consultations are likely to be more costly, the cost per project is likely to be significantly lower than the per-project cost for non-programmatic consultations. For that reason, applying a constant per-project cost estimate would significantly inflate the estimated level of consultation cost. Moreover, when multi-project consultations occur, they are likely to cover a wide geography. This makes it difficult to attribute those consultation costs to a particular area. Due to the uncertainties regarding the specific location, type, and frequency of future consultations, the current analysis does not project total administrative costs associated with this designation.

For contextual purposes, Table 1.3-1 presents generalized per-consultation administrative costs of consultations. In general, three different scenarios associated with the designation of critical habitat may trigger incremental administrative consultation costs:

- **Additional effort to address adverse modification in a new consultation -** New consultations taking place after critical habitat designation may require additional effort to address critical habitat issues above and beyond the listed species issues. In this case, only the additional administrative effort required to consider critical habitat is considered an incremental impact of the designation.
- **Re-initiation of consultation to address adverse modification -** Consultations that have already been completed on a project or activity may require re-initiation to address critical habitat. In this case, the costs of reinitiating the consultation, including all associated administrative and project modification costs are considered incremental impacts of the designation.
- **Incremental consultation resulting entirely from critical habitat designation -** Critical habitat designation may trigger additional consultations that may not occur absent the designation (e.g., for an activity for which adverse modification may be an issue, while jeopardy is not (*i.e.*, a determination has been made that the activity has no effect on the species), or consultations resulting from the new information about the potential presence of the species provided by the designation). All associated administrative and project modification costs of incremental consultations are considered incremental impacts of the designation.

The administrative costs of these consultations vary depending on the specifics of the project. One way to address this variability is to show a range of possible costs of consultation. Table 1.3-1 provides estimated

consultation costs representing effort required for all types of consultation, including those that consider both adverse modification and jeopardy. To estimate the fractions of the total administrative consultation costs that are baseline and incremental, the following assumptions were applied:

- Costs associated with an incremental consultation (one occurring because of the designation of critical habitat) would be attributed wholly to critical habitat;
- Incremental costs of a re-initiation of a consultation because of the critical habitat designation are assumed to be approximately half the cost of the original consultation that considered only jeopardy. This assumes that re-initiations are less time-consuming as the groundwork for the project has already been considered in terms of its effect on the species;
- Efficiencies exist when considering both jeopardy and adverse modification at the same time (e.g., in staff time saved for project review and report writing), and therefore incremental administrative costs of considering adverse modification in consultations that will already be required to consider jeopardy result in the least incremental effort of these three consultation categories, roughly half that of a reinitiation.

Importantly, the estimated costs represent the midpoint of a potential range of impacts to account for variability regarding levels of effort of specific consultations.

Table 1.3-1: Example Range of Administrative Consultation Costs (Per Consultation), $2007

Incremental Administrative Costs of Consultation ($2007)					
Consultation Type	**Service**	**Federal Agency**	**Third Party**	**Biological Assessment**	**Total Costs**
Incremental consultation resulting entirely from critical habitat designation					
Technical Assistance	$530	n/a	$1,050	n/a	$1,500
Informal	$2,300	$2,900	$2,050	$2,000	$9,500
Formal	$5,150	$5,800	$3,500	$4,800	$19,500
Programmatic	$15,500	$13,000	n/a	$5,600	$34,100
Re-initiation of consultation to address adverse modification					
Technical Assistance	$265	n/a	$525	n/a	$750
Informal	$1,150	$1,450	$1,030	$1,000	$4,750
Formal	$2,580	$2,900	$1,750	$2,400	$9,750
Programmatic	$7,750	$6,480	n/a	$2,800	$17,000
Additional effort to address adverse modification in a new consultation					
Technical Assistance	$133	n/a	$263	n/a	$375
Informal	$575	$725	$513	$500	$2,380
Formal	$1,290	$1,450	$875	$1,200	$4,880
Programmatic	$3,880	$3,240	n/a	$1,400	$8,510

Source: NMFS, (prepared by Industrial Economics), (2008).
Note: 1. IEc analysis of full administrative costs is based on data from the Federal Government Schedule Rates, Office of Personnel Management, 2007, and a review of consultation records from several Fish and Wildlife Service field offices across the country conducted in 2002.
2. Totals may not sum due to rounding.
3. Estimates reflect average hourly time required by staff.

Section 7 Project Modification Impacts

Section 7 consultation considering critical habitat may also result in additional project modification recommendations specifically addressing potential destruction or adverse modification of critical habitat. For consultations that consider jeopardy and adverse modification, and for re-initiations of past consultations to consider critical habitat, the economic impacts of project modifications undertaken to avoid or minimize adverse modification are considered incremental impacts of critical habitat designation. For consultations that are forecast to occur specifically because of the designation (incremental consultations), impacts of all associated project modifications are assumed to be incremental impacts of the designation.

Indirect Impacts

The designation of critical habitat may, under certain circumstances, affect actions that do not have a Federal nexus and thus are not subject to the provisions of section 7 of the Act. Indirect impacts are those unintended changes in economic behavior that may occur outside of the Act, through other Federal, State, local, or private actions that are caused by the designation of critical habitat. Below common types of indirect impacts that may be associated with the designation of critical habitat are identified. These types of impacts are not always considered incremental. If these types of conservation efforts and economic effects would occur regardless of critical habitat designation, they are appropriately considered baseline impacts.

Other State and Local Laws

Under certain circumstances, critical habitat designation may provide new information to a State or local government about the sensitive ecological nature of a geographic region, potentially triggering additional economic impacts under other State or local laws. In cases where these impacts would not have been triggered absent critical habitat designation, they are considered indirect, incremental impacts of the designation.

Additional Indirect Impacts

In addition to the indirect effects noted above, project proponents, land managers and landowners may face additional indirect impacts, including the following:

Time Delays - Both public and private entities may experience incremental delays for projects and other activities due to requirements associated with the need to reinitiate the section 7 consultation process and/or compliance with other laws triggered by the designation. To the extent that delays result from the designation, they are considered indirect, incremental impacts of the designation.

Regulatory Uncertainty - NMFS conducts each section 7 consultation on a case-by-case basis and issues a biological opinion on formal consultations based on species-specific and site-specific information. As a result, government agencies and affiliated private parties who consult with NMFS under section 7 may face uncertainty concerning whether project modifications will be recommended by NMFS and what the nature of these modifications will be. This uncertainty may diminish as consultations are completed and additional information becomes available on the effects of critical habitat on specific activities. Where information suggests that regulatory

uncertainty stemming from the designation may affect a project or economic behavior, associated impacts are considered indirect, incremental impacts of the designation.

Stigma - In some cases, the public may perceive that critical habitat designation may result in limitations on private property uses above and beyond those associated with anticipated project modifications or regulatory uncertainty. Public attitudes about the limits or restrictions that critical habitat may impose can cause real economic effects, regardless of whether such limits are actually imposed. All else equal, a property that is adjacent to the proposed designated critical habitat may have a lower market value than an identical property that is not adjacent to the boundaries of the proposed critical habitat due to perceived limitations or restrictions. The converse may also be true. As the public becomes aware of the true regulatory burden imposed by critical habitat, the impact of the designation on property markets may decrease. To the extent that potential stigma effects on markets are probable and identifiable, these impacts are considered indirect, incremental impacts of the designation.

These potential impacts are not explicitly addressed in this analysis, but were considered during the development of cost estimates.

1.4 Approach to Analysis

To quantify the economic impacts of modifications to land and water uses that result from critical habitat designation, the analysis employs the following five steps:

1. Define the geographic area for the analysis, and identify the specific areas to be analyzed for purposes of this designation. The proposed rule to designate critical habitat analyzes how each of these areas meets the definition of critical habitat set forth in Section 3 of the ESA.
2. Identify primary constituent elements (PCEs) and potentially affected economic activities (e.g., liquid natural gas or tidal-wave projects).
3. Estimate the baseline level of protection afforded leatherbacks by area and activity type.
4. For each economic activity, establish the existing and expected level of economic activity that may be affected by leatherback conservation efforts in each critical habitat area.
5. Estimate potential economic impacts of leatherback management by economic activity type and sum by area.

These steps are described in greater detail below.

1.4.1 Define Geographic Study Area

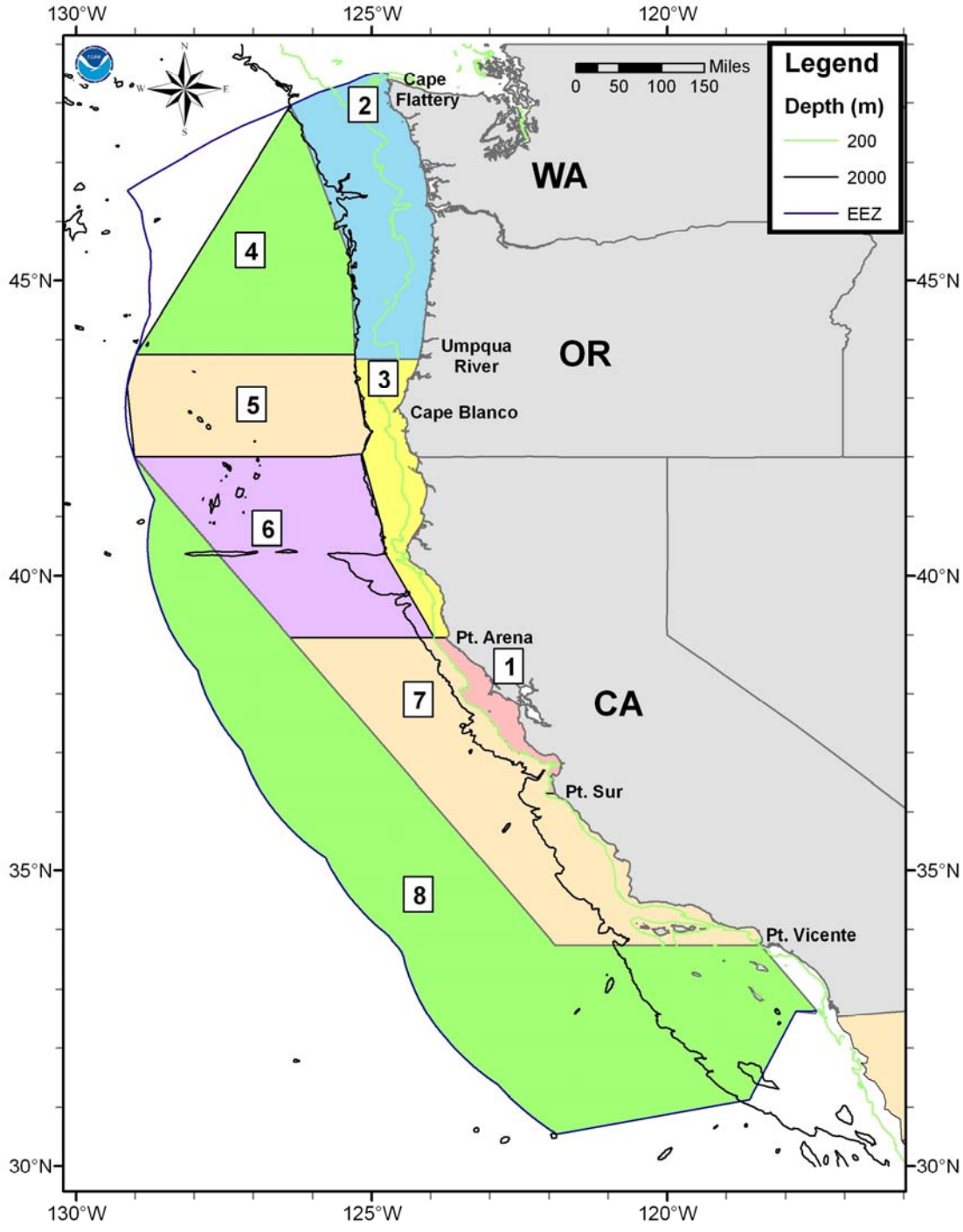
The geographic area spans from the California-Mexico border to Cape Flattery in Washington. NMFS has divided this area into 8 individual areas to be considered for critical habitat designation (hereafter, "areas"), as shown in Figure 1.4-1. The proposed rule to designate critical habitat for leatherbacks analyzes how each of these areas meets the definition of critical habitat. Below is the description of the 8 study areas:

- **Area 1:** Point Arena – Point Sur California and west to the 200 meter isobath.
- **Area 2:** Nearshore area from Cape Flattery, Washington to Umpqua River (Winchester Bay), Oregon and offshore to the 2,000 meter isobath.
- **Area 3:** Umpqua River, Oregon, west to the 2000 meter isobath, southwest to California/Oregon border, southeast to the 200 meter isobath west of Point Arena, California. Includes major upwelling centers between Cape Blanco, Oregon and Cape Mendocino, California.
- **Area 4:** Offshore area west and adjacent to area 2 (see above). Includes waters west of the 2000 meter isobath.
- **Area 5:** Offshore area west of Cape Blanco upwelling plume (warm water side of steep sea surface temperature gradient). Area is south and adjacent to area 4 (see above). Includes waters outside of the 2000 meter isobath west of Umpqua River, Oregon to the US EEZ limit (approximately), south to offshore waters west of Oregon/California border.
- **Area 6:** Offshore area extending from waters west of California/Oregon border, outside of area 3 (see above), south to Point Arena, California at the 200 meter isobath. Western border extends from US EEZ limit west of the California/Oregon border southeast to point west of Point Arena, California.
- **Area 7:** Includes waters west of the 200 meter isobath between Point Arena and Point Sur, California, adjacent to area 1 (see above) extending south to Point Vicente, California, including neritic waters south of Point Sur. Western border extends from point west of Point Arena, southeast to point west of Point Vicente. Area includes northern Channel Islands (San Miguel, Santa Rosa, Santa Cruz, and Anacapa Islands).
- **Area 8:** Extreme offshore waters off California bounded by western boundary of areas 6 and 7 (see above), the limit of the US EEZ, extending to the US/Mexico border. Includes southern Channel Islands (San Nicholas, Santa Barbara, Catalina, and San Clemente Islands).

While NMFS provided study area boundaries in ocean waters based on the presence of leatherbacks and their PCEs, the economic analysis at times uses county data to describe the presence and extent of some

activities, due to data availability. Where this occurs, we approximated which study areas the coastal county data would attribute to.

Figure 1.4-1 Proposed Leatherback Critical Habitat Areas



1.4.2 Identify PCEs & Potentially Affected Economic Activities

Joint NMFS-U.S. Fish and Wildlife Service regulations at 50 CFR 424.12(b) state that in determining what areas are critical habitat, the agencies "shall consider those physical and biological features that are essential to the conservation of a given species and that may require special management considerations or protection." Features to consider may include, but are not limited to:

(1) Space for individual and population growth, and for normal behavior;

(2) Food, water, air, light, minerals, or other nutritional or physiological requirements;

(3) Cover or shelter;

(4) Sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal; and generally;

(5) Habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of a species.

ESA regulation also require agencies to "focus on the principle biological or physical constituent elements" (hereafter referred to as "Primary Constituent Elements" or PCEs) within the specific areas considered for designation. NMFS identified two PCEs essential for the conservation of leatherbacks in marine waters of the U.S. West Coast (see Critical Habitat for Leatherback Sea Turtle Biological Report for more information on PCEs):

1. Occurrence of prey species, primarily Scyphomedusae of the order Semaeostomeae (Chrysaora, Aurelia, Phacellophora, and Cyanea) of sufficient condition, distribution, diversity, and abundance to support individual as well as population growth, reproduction, and development of leatherbacks
2. Migratory pathway conditions to allow for safe and timely passage and access to/from/within high use foraging areas

NMFS then identified 8 categories of economic activity that may have an effect on either of the two PCEs described above. These activities may require modification to avoid destruction or adverse modification of leatherback critical habitat. These "activities" include the operation of some facilities, such as water temperature control, where modifications may be required as a result of this designation. The following are the economic activities assessed in this analysis:

- NPDES permit activities
- Agricultural Pesticides
- Oil spills
- Power plants
- Desalination plants

- Tidal/wave energy projects
- Liquefied natural gas (LNG) projects
- Aquaculture

Using maps and data, this analysis first assesses the level of current and expected economic activity for each affected industry. The analysis then scales this level of activity to the number of projects expected to be affected annually by leatherback critical habitat designation (e.g., the number of proposed tidal/wave energy projects).

1.4.3 Estimate the Baseline Level of Protection Afforded Leatherbacks by Area and Activity Type

If a critical habitat rule goes into effect, activities affecting leatherbacks may require modification to avoid destruction or adverse modification of critical habitat. This analysis aims to understand the economic impacts of avoiding adverse impacts to leatherback critical habitat over and above other baseline protections that may already be in place. Because of the close relationship in terms of management requirements under the ESA between leatherbacks and other listed threatened and endangered species, protections for these species may provide the strongest baseline protections to leatherbacks within critical habitat areas. The following sections provide additional detail regarding baseline protections that are provided by these species to leatherbacks. In addition, a number of regulations, laws, and initiatives have been created specifically to address human-induced impacts on marine species. These are summarized in Appendix B.

Green Sturgeon, Salmon and Steelhead

Green sturgeon critical habitat includes marine waters within 60 fm depth including Monterey Bay, north to Cape Flattery, Washington. Thus, consultations on this species may overlap with the critical habitat being considered for leatherbacks. NMFS identified several activities that would affect green sturgeon critical habitat in marine coastal waters, including oil spills, and wave energy projects (73 FR 52084 September 8, 2008). These categories of activities have also been identified as special management concerns for critical habitat being considered for leatherbacks. It also is worth noting that all of the approximately 20 completed formal consultations that address impacts to green sturgeon to date also address impacts to one or more listed salmon and/or steelhead species. Salmonid species included in green sturgeon consultations to date have largely been located in Northern California.

Salmon and steelhead critical habitats are almost exclusively riverine and do not overlap with critical habitat being considered for leatherbacks. However, some modifications to upland and riverine activities

(e.g., restrictions to pesticide use) may affect water quality and prey in the proposed critical habitat areas for leatherbacks. The degree and extent of effects are unknown. Because of the high visibility and regional importance of salmon and steelhead species, numerous protections have already been undertaken on behalf of these species. For example, a critical habitat analysis for salmon and steelhead examined nearly 1,100 consultation actions over three years, or approximately 370 actions annually for salmon and steelhead species. These actions were authorized, funded, or carried out by nearly 30 Federal agencies in addition to NMFS.[9] In another example, the California Habitat Restoration Project Database, a database created in 1999 to capture and maintain data about habitat restoration projects in California benefiting anadromous fish, currently contains nearly 3,000 projects, of which 2,400 are completed and 600 are ongoing.[10] As described above, a number of other initiatives have been undertaken to address human induced impacts on anadromous species, many of which are summarized in Appendix B.

Delta Smelt

The analysis considered baseline protections resulting from the presence of the endangered delta smelt, a fish species that is endemic to the San Francisco Bay delta area. While conservation recommendations for delta smelt may not always benefit leatherbacks, conservation recommendations for some activities may provide a measure of protection for leatherback habitat. The Long Term Management Strategy for San Francisco Bay establishes consultation requirements year round for delta smelt.

Marine Mammals

The analysis also considers baseline protections resulting from the presence of marine mammals such as killer whales and Steller sea lions. While mitigation measures for marine mammals may not always benefit leatherbacks, conservation recommendations for some activities, particularly those that may affect passage in marine areas such as tidal/wave energy projects, may provide a measure of protection for leatherback and their habitat. For example, NMFS has considered impacts on marine mammals and sea turtles when commenting on proposed tidal energy projects (See National Marine Fisheries, *Comments on preliminary permit for San Francisco Bay Tidal Energy Project (FERC No. 12585)*, August 12, 2005.) Because the specific habitat requirements for marine mammals and leatherbacks are not closely related, no baseline protections for leatherbacks are assumed to exist in proposed critical habitat areas associated

[9] National Marine Fisheries Service. *Final Economic Analysis of Critical Habitat Designation for Seven West Coast Salmon and Steelhead ESUs*. Long Beach, CA, August 2005.

[10] Fish barrier data is available from the Calfish program, a cooperative effort headed by CDFG Wildlife and Habitat Data Analysis Branch and CDFG NCNCR Information Services Branch. Accessed at http://www.calfish.org/ on August 21, 2007.

with marine mammal protections. This approach likely underestimates baseline protections that may exist for leatherbacks in marine mammal habitat areas.

1.4.4 Establish Existing/Expected Level of Economic Activity Likely to be Affected by Critical Habitat

After establishing the level of baseline protections that exist, the analysis then assesses the number of current and expected actions likely to be affected by critical habitat designation for leatherbacks for each potentially affected economic activity in each proposed critical habitat area. This level of future activity is developed using GIS data and other published data on existing, pending, or future actions (e.g., FERC permit license data for liquefied natural gas projects). We recognize that in areas where other listed species coexist with leatherbacks, particularly green sturgeon, a portion of affected future projects in critical habitat areas would be expected to undertake conservation efforts that are protective of leatherbacks regardless of this rule. Thus, after estimating the number of projects potentially required to undertake conservation efforts, we then apply a scaling factor (the "incremental score") to more accurately represent the portion of the projects that would be affected by the proposed leatherback critical habitat over and above the existing baseline. For example, if a power plant in a proposed leatherback critical habitat area is required to implement conservation measures to minimize effects of water temperature changes, and that area contains critical habitat for salmon as well as critical habitat for leatherbacks, then we might assume that some portion of those projects would already implement these measures absent critical habitat for leatherbacks. In some cases, this concept of apportioning is applied to cost estimates to capture the portion of costs likely to occur associated with leatherback critical habitat over and above baseline impacts.

In order to determine the incremental scores associated with any possible change to activities, the existing protections in each area were considered. Information on various regulations that are believed to contribute to existing protections is available within this economic report. Also considered in some areas for some activities were consultations that NMFS has already engaged in via section 7 of the ESA and conservation measures have been included in those reports. Generally, areas closer to the shore have more laws in place to conserve and protect marine resources. These include the Coastal Zone Management Act and various state regulations along with regulations promulgated by the five National Marine Sanctuaries within the area. Critical habitat for green sturgeon has recently been designated in nearshore waters along much of the west coast and changes to activities necessary to protect green sturgeon may yield benefit to leatherbacks in these areas of overlap. Further, whether or not ESA listed species, critical habitat or marine mammals protected under the MMPA, were present in the area was

taken into consideration. While protection afforded to ESA and MMPA listed species may not directly affect leatherback PCEs, there may be benefit to the habitat already in place due to these laws. The following table provides an estimated level of current protection in each area and for each activity analyzed in this report. The dashes indicate that the activity does not exist or will not affect the corresponding area.

Table 1.4-1: Estimated Baseline Level of Protection

Area	NPDES	Agricultural Pesticides	Oil Spills	Power Plants	Desal-ination	Tidal/Wave Energy	LNG	Aqua-culture
1	med	med	high	high	High	med	-	High
2	high	high	high	-	-	-	med	-
3	med	med	high	-	-	med	med	-
4	-	-	med	-	-	-	-	-
5	-	-	med	-	-	-	-	-
6	-	-	med	-	-	-	-	-
7	med	med	med/high	high	Med	med	med	Med
8	-	-	med	-	-	-	med	Med

NMFS assigned incremental scores to coincide with the baseline protections as follows:

Table 1.4-2: Incremental Scores, Baseline Protection and Associated Costs

Incremental Score	Baseline Protection	Costs Associated with Leatherback Critical Habitat
0.70	Low	High
0.50	Medium	Medium
0.40	Medium-High	Low-Medium
0.30	High	Low

Therefore, where there is a high level of baseline protection, a low cost is expected to come solely from the designation of leatherback critical habitat. Conversely, where there is a low level of baseline protection, a high cost would be expected to come solely from the designation of leatherback critical habitat.

1.4.5 Estimate Potential Economic Impacts by Area

For each potentially affected economic activity, we identify project modifications that may be necessary to avoid destruction or adverse modification of the critical habitat being considered for leatherbacks. Because a large degree of uncertainty exists with regard to future actions likely to be undertaken specifically for the benefit of leatherbacks, this analysis begins by estimating economic impacts of likely management actions that may take into account leatherbacks as well as other listed species.

1.4.6 Calculate Total Impacts by Area

To create a total impact estimate for each critical habitat area, we multiplied the number of affected projects by the annualized costs per project and the incremental score for each area and economic activity type, then summed these activity scores in each area. This process is summarized in the following equation:

$$C_U = \sum_i N_{i,U} x C_{i,U} x I_{i,U}$$

Where

C_U = Total annualized economic impacts (costs) for area 'U' (*2009 dollars*)

$N_{i,U}$ = Annual number of affected projects for activity 'i' in area 'U'

$C_{i,U}$ = Annualized economic impacts (costs) on activity 'i' in area 'U' (*2009 dollars*)

$I_{i,U}$ = Incremental impact of leatherback critical habitat on activity 'i' in area 'U' (*0.3 – 0.7*)

The final estimates of the total impacts by area are presented in Section 3 of this analysis.

1.4.7 Analytical Time Frame

The analysis estimates impacts based on activities that are reasonably foreseeable, including activities that are currently authorized, permitted, or funded, or for which proposed plans are currently available to the public. In general, the time frame over which data are available to project land uses in the study area is 20 years. In most cases, therefore, the analysis estimates economic impacts from 2010 to 2029 (20 years from the expected year of a critical habitat designation).

1.5 Report Organization

The remainder of this report proceeds through three sections, including:

- Section 2. This section describes the 8 categories of economic activity that may require modification to avoid destruction or adverse modification of leatherback critical habitat, if designated.
- Section 3. Discusses the results of the analysis by area and activity. These results are derived from the activity counts and related cost estimates presented in earlier sections.

SECTION 2: ECONOMIC IMPACTS BY ACTIVITY

NMFS identified 8 categories of economic activity that may require modification to avoid destruction or adverse modification of leatherback critical habitat, if designated. This section describes each activity in terms of their threat to leatherbacks, extent of occurrence within critical habitat, specific baseline elements that may provide protection to leatherbacks, and potential economic impacts of leatherback conservation efforts. Six categories discussed: National Pollutant Discharge Elimination System (NPDES) facilities, agricultural pesticides, oil spills, power plants, desalination plants and tidal/wave energy projects all have a quantitative assessment with specific cost estimates presented for each activity type. Two activities, liquefied natural gas projects, and aquaculture facilities, are discussed qualitatively due to uncertainty of project modifications and lack of cost data.

It is important to note here that the critical habitat review team also considered impacts to PCE's from offshore wind energy projects, ocean acidification and commercial fishing activities. Due to a lack of data and uncertainty regarding the impacts from offshore wind energy projects and ocean acidification, the team was unable to fully consider potential impacts, therefore those activity types were not included in this analysis. When considering impacts to the prey PCEs from commercial fishing activities, the team looked at potential fisheries that would target jellyfish, but no such fishery was anticipated in the foreseeable future. The bycatch of jellyfish in existing commercial fisheries was also considered, but it was determined that the level of bycatch was limited. When considering impacts to the passage PCE, the team considered whether fishing gear could be considered an impediment to the passage of leatherbacks to and from their foraging areas, and if the presence of that gear altered the habitat. It was determined that only permanent or long-term structures would be considered for their potential to affect habitat and the passage PCE. Additionally, the direct take of the species in fishing gear is more appropriately considered under the jeopardy standard in ESA section 7 consultations. For these reasons, commercial fishing activities were excluded from this analysis.

2.1 Economic Impacts of Critical Habitat Designation on National Pollutant Discharge & Elimination System (NPDES) Facilities

2.1.1 Description of Threat

NMFS has identified point source pollution, particularly NPDES facilities as a threat to leatherback critical habitat in all areas; however, pollution would be found primarily in the coastal areas: Areas 1, 2, 3 and 7. This activity may affect prey resources, through contamination of all stages of jellyfish, including bioaccumulation of toxins through small prey ingestion. Limited studies have shown that jellyfish may

concentrate higher levels of metals (e.g. cadmium) proportionately than fish, and given the likely low energetic value of jellyfish and the fact that leatherbacks must consume large quantities to meet their needs, leatherbacks may be exposed to high levels of metals, particularly in coastal areas (Caurant et al. 1999).

2.1.2 Regulatory Environment & Extent of Activity

Under the NPDES program, the Environmental Protection Agency (EPA) sets pollutant-specific limits on the point source discharges for major industries and provides permits to individual point sources that apply to these limits. According to a 2001 Memorandum of Agreement between the EPA, National Marine Fisheries Service (NMFS), and the U. S. Fish and Wildlife Service (USFS), the EPA has provided States and Tribes authority over their Clean Water Act permitting when appropriate.[11]

Although development and implementation of State water quality standards are subject to a section 7 consultation between NMFS and the EPA, as an added precaution, NMFS may review each individual NPDES permit application to confirm that listed species are not adversely affected by water quality impacts. If the proposed permit does not appear to meet State water quality standards, NMFS may object to issuance of the permit, and the State may ask the applicant to alter the permit to meet the standards. Although the State Agencies themselves issue the vast majority of NPDES permits, the EPA issues federal NPDES permits for tribal lands and for any discharges into federal ocean waters beyond state boundaries.

The NPDES contains general and individual permits. General permits cover multiple facilities within a specific category; whereas, individual permits are tailored for a specific discharge and analyzed on a case-by-case basis. The EPA developed a major/minor classification system for individual industrial and municipal NPDES permits to provide an initial framework for setting permit issuance priorities during the first and second rounds of NPDES permit issuance. Major permits almost always have the capability to impact receiving waters if not controlled. Minor permits may or may not, adversely impact receiving waters if not controlled. There are approximately 65,000 dischargers in the United States which have

[11] U.S. Environmental Protection Agency, Department of the Interior, and the Department of Commerce, Memorandum of Agreement Between the Environmental Protection Agency, Fish and Wildlife Service and National Marine Fisheries Service Regarding Enhanced Coordination Under the Clean Water Act and Endangered Species Act; Notice, Federal Register Vol. 66, No. 36, February 22, 2001.

been issued NPDES permits. Currently, 7,500 of these, due to size or composition of wastewater or both are termed "major" permits. The remainder are termed "minor" permits.[12]

Table 2.1-1 presents the number of current NPDES permits for outfalls within one and 5 miles from the mean lower low water (MLLW) line within the identified critical habitat areas, which are most likely to have an affect on potential critical habitat. NPDES permitted outfalls are facilities holding permits to discharge municipal and industrial wastes to surface water. While these amounts represent active past and present permit locations, we assume the general pattern of permitting locations is likely to continue into the future.

Table 2.1-1: NPDES Permits

Area	Miles from mean low water line	Estimated Number of Facilities	
		Minor	Major
1	1	0	9
	5	0	10
2	1	0	11
	5	0	33
3	1	1	6
	5	1	10
7	1	0	24
	5	0	29
Source: US EPA Water Discharge Permit Compliance System (PCS)			

Section 403 of the Clean Water Act requires that NPDES permits for dischargers into the territorial seas, the contiguous zone and the oceans be issued in compliance with EPA's guidelines for determining the degradation of marine waters. Changes to the NPDES regulations on September 1, 1983 also provide that the Regional Administrator shall issue general permits covering discharges from offshore oil and gas facilities within the Region's jurisdiction. Ocean discharge criteria guidelines set forth criteria for determinations of unreasonable degradation and irreparable harm which must be addressed prior to the

[12] USEPA, Office of Water. "National NPDES Minor Permit Issuance Strategy," Office of Water Enforcement and Permits, Permits Division, Technical Support Branch. January, 1986.

issuance of a NPDES permit. Some factors considered in a determination of unreasonable degradation are: The composition and vulnerability of biological communities which may be exposed to such pollutants including threatened or endangered species, the importance of receiving water area to the surrounding biological community including forage areas and migratory pathways, the existence of special aquatic sites including marine sanctuaries and refuges, etc. and marine water quality criteria developed pursuant to Section 304(a)(1) of the Clean Water Act.[13]

2.1.3 Impacts of Critical Habitat Designation on NPDES Permitted Facilities

Leatherback critical habitat could impose modifications on NPDES permitted facilities, such as:

- Where federal permits are necessary, ensure discharge meets standards other than existing federal standards and regulations (EPA, CWA).
- Require measures to prevent or respond to a catastrophic event (i.e. using best technology to avoid unnecessary discharges).

Changes to discharge permits that may be required to accommodate leatherback critical habitat are unknown at this time. However, if changes were imposed, the goals would likely be to reduce the concentrations/levels/types of toxins into the environment inhabited by jellyfish species favored by leatherbacks.

Although there have been no formal consultations regarding water quality issues associated with leatherbacks to date, a number of such consultations have occurred with regard to other species that could be related to leatherback critical habitat, such as Pacific salmonid species. NOAA Fisheries has consulted with EPA on various aspects of its approval of State Water Quality Standards, including development of Total Maximum Daily Loads (TMDLs), review of non-temperature related Water Quality Standards and clean up of Superfund sites.

In general, the only project modification resulting from consultation for salmon or steelhead species pertained to water temperature controls. While NPDES-permitted facilities have always been required to adhere to certain temperature criteria associated with effluent discharge, the 2003 guidance has led to stricter standards where salmon and steelhead are known to spawn or rear. As a result, this analysis focuses on costs associated with the temperature criteria.

[13] USEPA, "The NPDES Permitting Process for Oil and Gas Activities on the Outer Continental Shelf." June 18, 1985.

The EPA and NOAA Fisheries authored guidance to States and tribes in 2003 on the development of temperature criteria deemed protective of salmon and steelhead. As a result, NPDES-permitted facilities in the Pacific Northwest are required to ensure effluent discharge does not raise the temperature in receiving waters above site-specific minimum temperature standards.[14]

This analysis estimates that if modifications to pollution discharge operations are required to comply with the temperature control criteria, NPDES-permitted facilities may identify and employ a number of temperature control procedures through Temperature Management Plans (TMPs). Control efforts may include process optimization, pollution prevention, land application, and/or cooling towers. The analysis estimates the operations and maintenance (O&M) costs and capital expenditures necessary to comply with the temperature control criteria.

Using EPA data, major facilities are assumed to require significant capital expenses to comply with the temperature criteria, while minor facilities are assumed only to require O&M expenditures. This analysis assumes that minor facilities will incur costs of $0 to $14,800 annually (2009$) to comply with temperature control criteria, while major facilities will incur $5,650 to $37,000 annually in O&M costs.[15] In addition, major facilities are assumed to incur capital costs of $458,000.[16] Based on EPA's sample of facilities, capital costs are assumed to be incurred in the first year, and operations and maintenance (O&M) costs are incurred uniformly over a 20 year period.

2.1.4 Summary of Economic Impacts to NPDES Facilities by Area

Table 2.1-2 presents a summary of our findings regarding the economic impacts arising out of special management considerations for NPDES-permitted facilities as a result of this designation. While NMFS consults on all federal and tribal permits, it does not necessarily consult on every state permit; however, for purposes of this analysis we assumed consultation on all permits. Therefore, these estimated costs are likely to be an overestimate of the true costs. Area 7 is estimated to be associated with the highest economic impacts related to management of pollutant discharge into water

[14] U.S. Environmental Protection Agency (EPA). "Region 10 Guidance For Pacific Northwest State and Tribal Temperature Water Quality Standards." EPA 910-B-03-002, April 2003.
[15] This analysis applied EPA's economic impact assessment to estimate modification costs for NPDES permitted facilities. See NMFS August, 2005 for more information.
[16] Economic Analysis of the Proposed Water Quality Standards Rule for the State of Oregon. Science Applications International Corporation. Reston, VA. 2003. EPA No. 68-C-99-252; Adapted from NMFS, Final Economic Analysis of Critical Habitat Designation for Seven West Coast Salmon and Steelhead ESUs, Long Beach, CA, August 2005. Adjusted to 2009 dollars using the U.S. Bureau of Economic Analysis, National Economic Accounts, National Income and Product Accounts table, 2009.

bodies. When using the 5 mile buffer zone, Area 2 also has a high economic impact. Areas 1 and 3 are associated with a moderate amount of costs.

Table 2.1-2: Summary of Economic Impacts to NPDES Facilities by Area

Area	Buffer Zone	Estimated Number of Facilities		Incremental Score	Total Annualized Costs (Discounted at 7%)					
					Minor			Major		
		Minor	Major		Low	Mid	High	Low	Mid	High
1	<1	0	9	0.5	$0	$0	$0	$215,300	$288,000	$360,700
	<5	0	10		$0	$0	$0	$239,300	$320,050	$400,800
2	<1	0	11	0.3	$0	$0	$0	$157,900	$211,200	$264,500
	<5	0	33		$0	$0	$0	$473,700	$633,650	$793,600
3	<1	1	6	0.5	$0	$3,700	$7,400	$143,600	$192,050	$240,500
	<5	1	10		$0	$3,700	$7,400	$239,300	$320,050	$400,800
7	<1	0	24	0.5	$0	$0	$0	$574,200	$768,050	$961,900
	<5	0	29		$0	$0	$0	$693,800	$928,050	$1,162,300
Total					$0	$7,400	$14,800	$2,737,100	$3,661,100	$4,585,100

2.2 Economic Impacts of Critical Habitat Designation on Agricultural Pesticide Application

2.2.1 Description of Threat

NMFS has identified agricultural pesticide application as a specific non-point source pollution activity that poses as a threat to leatherback critical habitat in the coastal areas: Areas 1, 2, 3 and 7. This activity may affect prey resources through contamination of all stages of jellyfish, including bioaccumulation of toxins through small prey ingestion. Pesticide application could affect water quality and prey resources available within some of the areas being considered for critical habitat.

2.2.2 Regulatory Environment & Extent of Activity

Many common pesticides have carcinogenic/mutagenic properties (U.S. EPA 2005). Pesticides are also known to cause adverse effects in wildlife by disrupting endocrine systems (Kavlock *et al* 1996). Even at levels below those expected to result in direct mortality, exposure to these compounds may have unknown mutagenic, developmental and reproductive effects through consumption of contaminated prey. Unlike direct toxicity effects, the dose response relationship for carcinogenicity and endocrine disruption for many pesticides is not known and therefore the spatial extent from shore where these exposures would be discountable cannot be determined. Although pesticides are likely to be extremely diluted by the time they disperse into the open, marine environment, contaminants can be collected in nearshore areas driven

by bathymetry or orography (submerged physical features).[17] As a result, any exposure to these compounds could conceivably result in adverse impacts to prey consumed by leatherbacks in an area concentrated by pesticides. Therefore, it is reasonable to assume that there may potentially be adverse impacts to leatherbacks and their habitat in any nearshore waters receiving runoff from lands where pesticides are used.

2.2.3 Impacts of Critical Habitat Designation on Agricultural Pesticide Application

Until recently, formal consultations on pesticide use were limited to U.S. Forest Service invasive plant control in Gifford Pinchot National Forest and Olympic National Forest in WA and Sacramento CA, Bureau of Land Management 5-year integrated pest management programs in WA and OR,
In July 2002, a federal court ordered EPA to consult with the USFWS and NMFS to ensure that the registration of 37 pesticide active ingredients under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) complies with section 7 of the ESA. In January 2004, the EPA was enjoined from authorizing the application of a set of pesticides within certain distances from "salmon-supporting waters."[18] The EPA was required to consult with NMFS concerning possible adverse effects of pesticide applications on salmon and steelhead protected under the ESA. The court imposed two types of restrictions on application of pesticides covered in the lawsuit. For aerial applications, no pesticides can be applied within 100 yards of "salmon-supporting waters"; for ground applications, the distance is 20 yards.[19] Although unknown at the present time, given the primarily marine environment inhabited by leatherbacks, some management measures could be placed on the application to restrict pesticides to protect leatherback critical habitat, if designated, in the future.

NMFS has now completed consultation on registration of 6 of 37 pesticide active ingredients that were part of the litigation – chlorpyrifos, malathion and diazinon in a biological opinion of November 18, 2008, and carbaryl, carbamate and methomyl in a biological opinion of April 20, 2009. NMFS concluded that the registration of these pesticides was likely to jeopardize most listed salmon populations and was likely to adversely modify critical habitat. NMFS identified reasonable and prudent alternatives that included, among other things, buffers of 1000 feet for aerial application and 500 feet for ground applications. EPA has not yet implemented these restrictions.

This analysis assumes that the court-ordered injunction restricting pesticide use on salmon and steelhead species will provide some protection in leatherback critical habitat areas, depending on the pesticide and

[17] Personal communication with Steve Bograd, NMFS SWFSC (2009).
[18] Washington Toxics Coalition, et al. v. EPA, C01-0132 (W.D. WA), 22 January 2004.
[19] Ibid.

degree of dispersal (e.g., pesticides that are carcinogenic or disrupt the endocrine system may pose a risk throughout the proposed critical habitat area). Although the below mitigation measures will aid in the protection of leatherbacks and their habitat from the direct toxic effects of pesticide exposure, they do not account for the potential risks that these carcinogenic and endocrine disrupting properties may pose.

To the extent that management actions are needed for herbicide use, they could include similar best management practices for application of herbicides that were outlined in a consultation on salmon and steelhead species through minimizing the amount and type of pesticide that enters estuarine and marine waters.[20] The following measures may or may not be appropriate for reducing impacts to coastal waters designated as critical habitat:

- All vegetation removal will be restricted to above the ground surface, thus leaving the root systems intact and retaining bank stability.
- Within 100 ft of each side of any waterway vegetation taller than 15 ft may be cut to the 15 ft level.
- No garlon will be applied with a 100-foot buffer on either side of all streams with ESA-listed fish. Rodeo may be used within this area.
- Trained individuals will apply herbicides using only low pressure spot spray and direct wicking application methods. All herbicide applications will be conducted in accordance with label instructions.
- Spray activities will only occur during dry, calm weather conditions to prevent drift and runoff. No spraying will occur during winds greater than five mph or during rain events. No spraying of the herbicide will occur if rain is forecast within 24 hours.
- Spill response procedures have been developed and reviewed with each applicator before commencing herbicide application operations.
- All chemical storage, chemical mixing, and post-application equipment cleaning is completed in such a manner as to prevent the potential contamination of any perennial or intermittent waterbody, unprotected ephemeral waterway, or wetland.
- Use only those sprayers with a single nozzle, such as backpack or hand sprayers, to spray the herbicide in the riparian zone.
- All hand operated application equipment is leak and spill proof.

[20] NMFS, Northwest Region, Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation on the Port of St. Helens Industrial Outfall and Portland General Electric Power Plant, Port Westward Industrial Park, Columbia River, Columbia County, Oregon (Corps No. 200200448), August 1, 2003.

This analysis assumes that, for the remaining 31 active ingredients NMFS must still complete consultation, the court-ordered injunction restricting pesticide use represents the likely outcome of section 7 consultations for this activity. This analysis also assumes that there are no adjustments in cropping or pesticide practices possible nor are there alternative beneficial uses of land. This analysis also assumes that without the ability to apply pesticides, the total affected crop will be lost. Thus, it is likely an overestimate of actual impacts.

This analysis used spatial soil data to determine the amount of prime farmland within one and 5 miles from the MLLW within proposed critical habitat areas that were 100 yards from a waterbody (i.e. stream, river). Prime farmland is defined as land that has been used for irrigated agricultural production at some time during the four years prior to collection and has certain soil attributes determined by the USDA. Therefore, the high range cost estimates include all prime farmland acres identified and the low range cost estimates were multiplied by 25 percent to account for the definition of prime farmland.

Table 2.2-1: Estimate of Acres under Farming in Areas Potentially Affected by Proposed Action

	Estimated Prime Acres of Farmland	
Area	1 mile from MLLW & 100 yards from waterbody (acres)	5 miles from MLLW & 100 yards from waterbody (acres)
1	1,120	4,285
2	3,364	18,763
3	1,915	10,304
7	2,506	8,207
Source: USDA NRCS Soil Survey Geographic Database (SSURGO)		

Values of cropland in the form of market value of crops sold were estimated using county data from the 2007 Census of Agriculture (USDA, NASS 2009). The analysis determined a foregone value from sales of crops due to pesticide restrictions.

Table 2.2-2: Estimated per Acre Impacts by Area

Area	**Estimated Value of Cropland per Acre**
1	$2,200
2	$140
3	$700
7	$2,400

2.2.4 Summary of Economic Impacts to Agricultural Pesticide Application by Area

Table 2.2-3 presents a summary of potential impacts to agricultural pesticide application within one and 5 miles of the MLLW within proposed critical habitat areas. These costs are likely overestimated since even with pesticide prohibition, it is possible that the farmland may be used for other purposes; however,

this analysis did not include alternative uses of the farmland. Area 7 has the highest impact due to the moderate amount of prime farmland along with a high value of cropland. Area 1 has the second highest impacts, and is about half the costs of Area 7. Areas 2 and 3 have larger amounts of prime farmland than Areas 1 and 7; however, the value of cropland in those areas is much lower and therefore total impacts are moderate.

Table 2.2-3: Summary of Economic Impacts to Agricultural Pesticide Application by Area

Area	Miles from MLLW within 100 yards of waterbody	Acres	Incremental Score	Total Annualized Impacts (Discounted at 7%)		
				Low	Mid	High
1	<1	1,120	0.5	$308,100	$770,200	$1,232,300
	<5	4,285		$1,178,400	$2,945,950	$4,713,500
2	<1	3,364	0.3	$35,300	$88,300	$141,300
	<5	18,763		$197,000	$492,500	$788,000
3	<1	1,915	0.5	$167,600	$419,000	$670,400
	<5	10,304		$901,600	$2,254,050	$3,606,500
7	<1	2,506	0.5	$751,700	$1,879,150	$3,006,600
	<5	8,207		$2,462,000	$6,155,100	$9,848,200
Total				$6,001,700	$15,004,250	$24,006,800

2.3 Economic Impacts of Critical Habitat Designation on Oil Spills

2.3.1 Description of Threat

NMFS has identified oil spills as a potential threat to the essential features of the areas being considered for leatherback critical habitat in all areas: Areas 1, 2, 3, 4, 5, 6, 7, and 8. Oil spills may have localized impacts affecting migratory pathway conditions, including impedance of movement and physical disturbance (e.g. booming, *in situ* burning), or prey (oil and/or the use of chemical dispersants, *in situ* burning to respond to the spill). Dispersants are chemicals that reduce the oil/water interfacial tension, thereby decreasing the energy needed for the slick to break into smaller droplets and mix into the water column. Dispersed oil generally does not penetrate below approximately 10 meters in measurable concentrations. The allowable dispersants (Corexit 9500 and Corexit 9527) may be toxic to jellyfish and the prey they depend on such as the sensitive life stages of zooplankton, although most studies have been conducted on juvenile fish and invertebrates. Dispersing oil into the water column may also increase its availability and impact to jellyfish below the water surface, but this is expected to be localized. Sublethal effects to jellyfish by use of dispersants could include depressed reproductive success and growth, but this is unknown and therefore speculative. In situ burning removes oil from the water surface by burning it in place. Burn residue is produced, and responders attempt to collect as much as possible before it sinks. Any jellyfish in the surface or uppermost layers of the water column in the area of a burn may be

vulnerable, although it would be likely localized and the surface area is likely to be very small relative to the total surface area and depth of a given body of water. The effects of oil on jellyfish are largely unknown. Leatherbacks encountering an oiled area that is being treated through *in situ* burning may be affected through impairment of their passageway. Booming involves the use of continuous, flexible floating barriers placed on the surface of the water to control the transport of spilled oil. Although booms are not permanent or long-term structures in the water, the presence of booms, oil on the surface of the water and in situ burning were considered together to have the potential to severely alter the habitat to the degree that leatherback passage through an oil spill area would be impacted.

2.3.2 Regulatory Environment & Extent of Activity

The United States Coast Guard (USCG) has the authority to respond to all oil and hazardous substance spills in the offshore/coastal zone, while the EPA has the authority to respond in the inland zone. The EPA and the USCG oversee the Oil Pollution Prevention regulations promulgated under the authority of the Federal Water Pollution Control Act. Among other issues, these regulations address requirements for Spill Prevention, Control and Countermeasure Plans and Facility Response Plans for offshore and onshore oil producers and carriers. The Facility Response Plans are submitted to the USCG for the transportation-related portion of the facility and to EPA for the non-transportation portions. The National Oil and Hazardous Substances Pollution Contingency Plan (or National Contingency Plan), is the Federal government's guideline for responding to both oil spills and hazardous substance releases. The Northwest Area Contingency Plan (NWACP), developed by the Northwest Area Committee, serves as the primary guidance document for responders in Washington, Oregon, and Idaho to oil spills and hazardous materials spills. Under the NWACP, the USCG has the authority to respond to all oil and hazardous substance spills in the coastal zone, the EPA has authority to respond in the inland zone, and the States, themselves, respond within state boundaries. The NWACP also contains the "Northwest Area Shoreline Countermeasures Manual and Matrices," which describes Northwest area-specific habitat and response strategies that should be recommended or conditionally recommended in case of an oil spill.[21] Regional Response Team IX (RRT-IX) is a formal organization of tribal, state and federal agencies as defined by the National Contingency Plan. Co-chaired by the EPA and the USCG, RRT-IX is responsible for ensuring that state and federal resources are available when needed for emergency response within the states of Arizona, California and Nevada and the 146 tribal nations, and that the multi-agency

[21] NOAA Fisheries, Endangered Species Act Section 7 Programmatic Formal Consultation and Magnuson- Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Oil Spill Response Activities Conducted Under the Northwest Area Contingency Plan (NWACP), November 6, 2003.

relationships and coordination systems exist to support these emergency response efforts (The Regional Contingency Plan for federal region IX).[22]

NOAA's Emergency Response Division (ERD), part of NOAA's Office of Response and Restoration facilitates spill prevention, preparedness, response, and restoration at national and local levels. Information on present and past spills and summary documents are provided on their website and serve as a communications tool to various responders, federal and local planners (http://www.incidentnews.gov). The ERD has responded to nearly every major marine spill in the United States over the last 25 years.

In 2001, an "Inter-agency Memorandum of Agreement (MOA) Regarding Oil Spill Planning and Response Activities under the FWPCA's National Oil and Hazardous Substances Pollution Contingency Plan and the Endangered Species Act" was signed by NOAA, USFWS, EPA, and USCG. The purpose of the MOA is to increase cooperation and understanding among agencies involved in ESA compliance at every stage in oil spill planning and response. The MOA outlines procedures to streamline the ESA compliance process before, during, and after an incident.

In November 2003, NOAA issued a programmatic biological opinion to EPA and USCG that addressed most response actions undertaken by these agencies to limit or prevent oil discharges and their effects on listed species and their habitats in the Pacific Northwest. This consultation included sea turtle species along with numerous salmon species, whale species, and the Steller sea lion. The consultation found that many oil spill response activities could be treated programmatically, but that some actions which were "less predictable" were identified as potentially requiring individual consultation.[23]

The extent of oil spills can be determined by the occurrence of oil spills and the quantity of oil spilled. The USCG records indicate that nationally, 95 percent of oil spills are spills of less than 1,000 gallons.[24] "Major" spills are 10,000 gallons or more. "Serious" spills are 25-10,000 gallons.[25] National data from 1992-2001 on oil spills is presented in Table 2.3-1. The data shows that the number of spills and amount of oil spilled has generally decreased since 1997.

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[22] California Department of Fish and Game. *The Regional Contingency Plan for federal region IX*. Accessed at: http://www.dfg.ca.gov/ospr/response/acp/marine/2005RCP/RCP102405.pdf.

[23] NOAA Fisheries, Endangered Species Act Section 7 Programmatic Formal Consultation and Magnuson- Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the Oil Spill Response Activities Conducted Under the Northwest Area Contingency Plan (NWACP), November 6, 2003.

[24] National Marine Fisheries Service (NMFS). *Economic Impacts Associated with Potential Critical Habitat Designation for the Southern Resident Population of Killer Whales*. November 7, 2006.

[25] Puget Sound Water Quality Action Team. *State of the Sound 2004*. Accessed at: http://www.psparchives.com/publications/puget_sound/sos/04sos/PSATSOS2004.pdf on June 9, 2009.

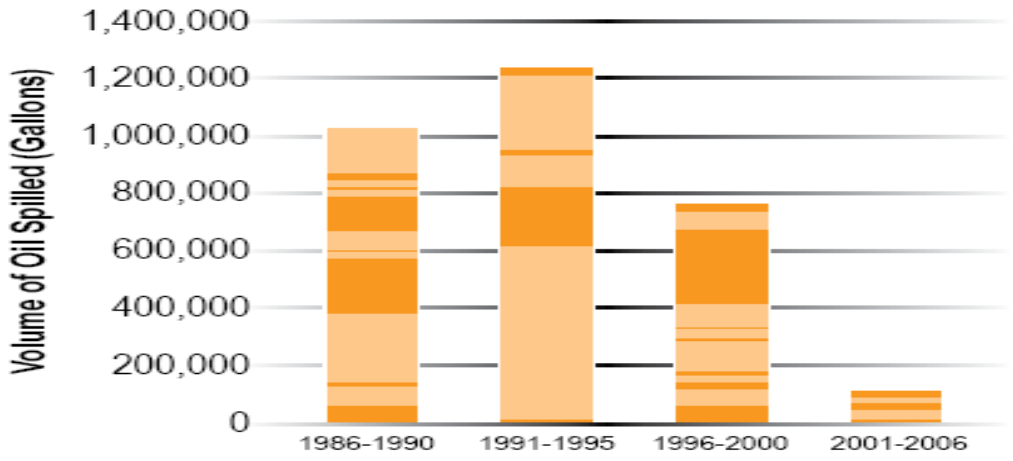
Table 2.3-1: U.S. National Oil Spill Data

Year	Number of Spills	Gallons Spilled
1992	708	1,585,955
1993	618	2,060,422
1994	662	3,945,487
1995	505	1,899,525
1996	521	3,146,931
1997	395	1,019,809
1998	436	798,832
1999	367	1,315,204
2000	353	838,044
2001	253	501,045

Source: U.S. Coast Guard (USCG). "Oil Spill Response Research & Development Program, A Decade of Achievement." U.S. Coast Guard Research & Development Center, Groton, CT 06340-6048, Report No. CG-D-07-03. Accessed at: http://www.uscg.mil/hq/cg9/rdc/Reports/2003/CGD0703Report.pdf

In Washington, between 2001 and 2006, there were 5 oil spills, totaling about 100,000 gallons of oil spilled. This is a significant decrease from previous years: 1996-2000 had about 13 such oil spills totaling almost 800,000 gallons of oil; 1991-1995 had 6 oil spills that totaled about 1.25 million gallons of oil and 1986-1990 had 14 oil spills totaling about 1.0 million gallons of oil (see figure 2.3-1, where each colored band indicates a distinct spill over 10,000 gallons in five year periods).

Figure 2.3-1 Washington volume of oil spilled (gallons)[26]



[26] Washington State Department of Ecology. *2006 Annual Report of Spill Prevention, Preparedness and Response Program*. Accessed at: http://www.ecy.wa.gov/pubs/0708002.pdf on April 2009.

In Washington, vessel inspections occur to check vessel compliance with state spill prevention regulations and to provide technical assistance. Investigations are also conducted to determine causes of incidents. In 2006, there were 1,587 vessel inspections (see figure 2.3-2). The figure shows a trend over the years of increased inspections correlating with a decrease in incident rates. Some of the recent drop in oil spill incidents can be attributed to a rise in the frequency and quality of inspections.

Figure 2.3-2 Vessel incident rate and vessel inspections from 1998-2006

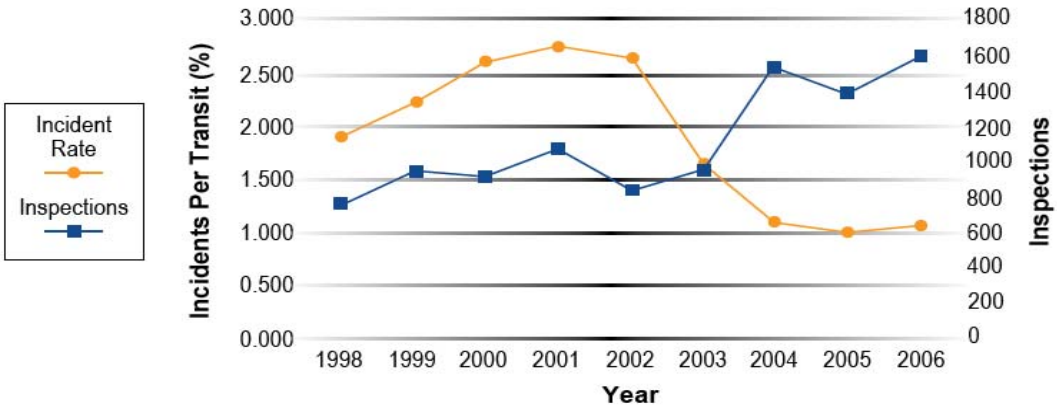
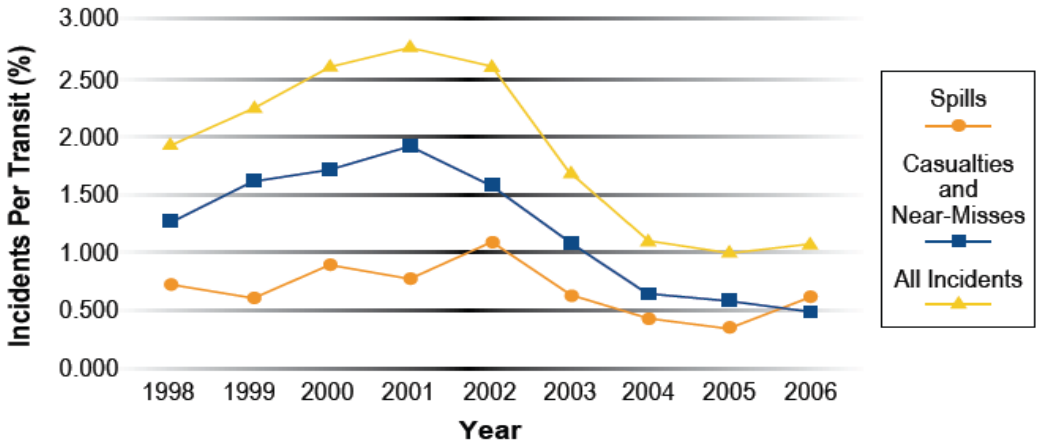


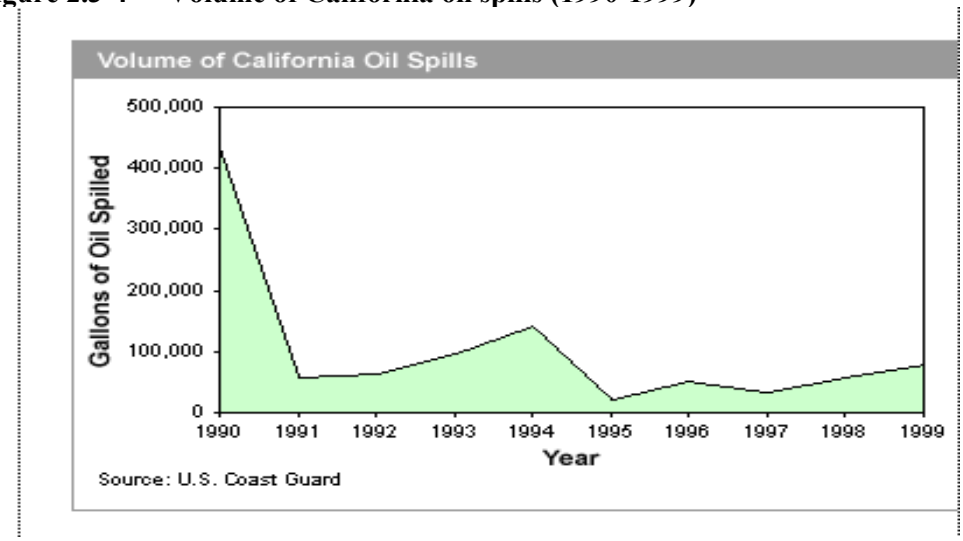
Figure 2.3-3 shows vessel incident rates. Incident rates were calculated as the percentage of trips in which large commercial vessels experience significant problems, such as an oil spill or a loss of propulsion or steering, out of the total number of transits in state waters. The incident rate has been around one percent from 2004-2006. There were 30 spills from large commercial ships during 2006. Improved compliance by large vessels has led to a statewide drop in oil spills and near misses

Figure 2.3-3 Vessel incident rate from 1998-2006 for all Washington waters



In California, total gallons of oil spills have been less than 100,000 gallons per year from 1995-1999 (see Figure 2.3-4).

Figure 2.3-4 Volume of California oil spills (1990-1999)[27]



In Washington, the Department of Ecology (DOE) has a Spill Prevention, Preparedness and Response Program, which spends $14.0+ million/year, with most going to salaries, etc., and approximately $8.0 million/year covering spill prevention, preparedness, response, and damage assessment. In 2006, the DOE and their partners/contractors responded to over 40 spills, and monitored three disabled container ships in the marine environment, none of which spilled oil. Over the years, the number of spills has

[27] Natural Resource Defense Council (NRDC). *Oil Spills*. Accessed at: http://www.nrdc.org/greengate/wildlife/oilf.asp, on September 15, 2008.

decreased, likely due to stricter regulations and requirements as well as better preparedness. Oregon's Department of Environmental Quality has a similar program to handle minor and major spills and levies annually per vessel, dredge, or facility to pay for their marine spill response program. In California, the Office of Spill Prevention and Response (OSPR) was created after the Exxon Valdez spilled in 1989 and then another large vessel spilled 300,000 gallons of crude oil off Southern California in 1990. OSPR has the Department of Fish and Game's public trustee and custodial responsibilities for protecting, managing and restoring the State's fish, wildlife, and plants. It is one of the few State agencies in the nation that has both major pollution response authority and public trustee authority for wildlife and habitat. This mandate ensures that prevention, preparedness, restoration and response will provide the best protection for California's natural resources. In the last few years, the largest oil spill took place in San Francisco Bay when a container ship, the M/V Cosco Busan collided with a pier and dumped 50,000+ gallons of heavy fuel oil in November, 2007.

2.3.3 Impacts of Critical Habitat Designation on Oil Spills

Designation of leatherback critical habitat could impose modifications related to oil spills, including response and cleanup, such as:

- Conduct surveys prior to oil spill response (e.g. use of boom, sorbents, skimmers, dispersants, *in situ* burning), to minimize impacts to leatherbacks PCEs.
- Restrict or minimize the use or type of response to oil spills (e.g. boom, dispersants, *in situ* burning) in areas where leatherback PCEs are found to be present.

Impacts from modifications are difficult to quantify due to the unpredictability of oil spills but would include costs from training and contingency planning requirements, which already take place to a large degree, and surveys (aerial, vessel, etc.) prior to or during oil spill response to minimize impacts to leatherback critical habitat. Costs could also be incurred from use of an alternate oil spill response methodology to minimize impacts to leatherback PCEs.

A range of cost estimates for the cleanup of oil spills were calculated using a "cleanup cost estimation model" presented by Etkin (1999). This model includes various attributes to describe an oil spill, which include: location, shoreline oiling, oil type, cleanup strategy, and total spilled. For each feature, there were anywhere from 2 to 8 options. The following shows the attributes used for estimates in this analysis:

Location: USA

Shoreline Oiling: minimal (used for offshore areas) and moderate and major (used for inshore areas)

Oil Type: light crude (less impact due to more rapid evaporation and dispersal) and heavy crude
Cleanup Strategy: dispersants only and dispersants primary (both typically used for offshore oil spills, Areas 4, 5, 6, half of 7 and 8) and mechanical/ manual recovery and dispersant (nearshore and shoreline areas (Areas 1, 2, 3 and half of 7)
Total Spilled: < 30 tons and > 15,000 tons

The above characteristics were used to present a cost range for both inshore and offshore areas. These cost results provide a cleanup cost per gallon spilled of oil. Then it was assumed that 20,000 gallons of oil (equivalent to approximately 68 tons) would be spilled annually in each area to provide annual cleanup cost estimates per area. In general, cleanup costs decrease significantly on a per-ton basis; that is, a larger spill will be much less expensive per ton than a smaller spill, given the costs associated with setting up the response, bringing in equipment, labor, etc. In addition, use of dispersants offshore to prevent impacts to the shoreline is typically less expensive than shoreline cleanup (Etkin 1999).

The amount of 20,000 gallons was chosen for a few reasons. NOAA's Office of Response and Restoration (OR&R) provides a map on their website[28], which shows the locations of oil spills and other incidents for which NOAA provided scientific support for the response. It also shows the locations of other major spills, but it does not show the location of every significant oil spill. According to this information, in 2007, there was one spill off the West Coast with an estimated 53,000-58,000 gallons of oil spilled (M/V Cosco Busan, in San Francisco Bay). There were no spills off the West Coast shown in years 2002-2006, but in 2001, there were four spills shown with quantity estimates of 8,000 gallons, 21,000 gallons, 11,900 gallons and 750 gallons, respectively. Therefore, average amount of oil spilled per incident from 2001 and 2007 is about 20,000 gallons. Furthermore, in the previous section 2.3.2, it is noted that the Coast Guard records indicate that nationally, 95 percent of oil spills are spills of less than 1,000 gallons. Lastly, in Washington, between 2001 and 2006, there were 5 oil spills, totaling about 100,000 gallons of oil spilled, which on average is 20,000 gallons per spill. This analysis assumes that only one oil spill incident would occur annually in each area.

While an estimate of 20,000 gallons spilled annually makes sense for the nearshore areas (Areas 1, 2 and 3, much of Area 7 and part of Area 8 (southern Santa Barbara Channel Islands and Point Vicente), given the historical spill data, an offshore oil spill is extremely rare. Most of the spills documented from 1957-2009 were within 20 miles of the coast. Causes for the spills ranged from collisions (rare), vessel groundings, vessel capsizing, transfer of fuel between vessels or at oil platforms, and "mystery spills."

[28] http://www.incidentnews.gov/map

While such spills are monitored, in nearly all cases, no response to the oil spill was mounted due to size, location (i.e. little risk to shoreline or marine resources), rapid dissipation or evaporation, or weather. Furthermore, between 2002 and 2008 there were no documented offshore oil spills. Because oil spills are unpredictable, we cannot assume that 20,000 gallons of oil could not be spilled in offshore areas, but this estimate is very conservative.

2.3.4 Summary of Economic Impacts to Oil Spill Activities by Area

Table 2.3-2 below presents a summary of potential impacts from the cleanup of oil spills within proposed critical habitat areas. Because all areas used the assumptions for number of occurrences and quantity of spill, the results are fairly similar; however, there are differences between the inshore and offshore areas as well as differences due to the incremental scores. The highest cleanup costs are expected to be located in the inshore areas, areas 1, 2 and 3, with area 7 having the next highest cost, which is both inshore and offshore. Although the costs presented do not take into account the likelihood of a spill occurring in one area as opposed to another; these costs are particularly useful when comparing total impacts of all activities by area.

Table 2.3-2: Summary of Economic Impacts from Oil Spill Cleanup by Area

Area	Estimated # of gallons	Incremental Score	Total Impacts Per Spill (Discounted at 7 %)		
			Low	Mid	High
1	20,000	0.3	$336,900	$458,550	$580,200
2	20,000	0.3	$336,900	$458,550	$580,200
3	20,000	0.3	$336,900	$458,550	$580,200
4	20,000	0.5	$25,100	$46,650	$68,200
5	20,000	0.5	$25,100	$46,650	$68,200
6	20,000	0.5	$25,100	$46,650	$68,200
7	20,000	0.4	$234,600	$324,350	$414,100
8	20,000	0.5	$25,100	$46,650	$68,200
Total			$1,345,700	$1,886,600	$2,427,500

2.4 Economic Impacts of Critical Habitat on Power Plants

2.4.1 Description of Threat

NMFS has identified power plants as a potential threat to leatherback critical habitat in two study areas: Areas 1 and 7. One potential threat from power plants to prey resources of leatherbacks is the plants' use

of coastal waters for cooling and subsequently discharging heated water back into the marine environment. This may involve the discharge of up to one million gallons of sea water for use in cooling the plant's main condenser. This water may be warmer than the ambient water temperatures and therefore may affect jellyfish survivability, recruitment into benthic habitat, and development, as well as prey resources (e.g. mesozooplankton, fish larvae, etc.). The impacts of power plant discharge of higher water temperature (and potentially treated water) are unclear. The release of thermal effluents that may raise water temperature in leatherback habitat has also been shown to cause jellyfish blooms (*see* Purcell et. al. 2007), which may be a positive effect on the prey PCE and therefore leatherback habitat.

At the Diablo Canyon Power Plant, in order to control biofouling, part of the auxiliary salt water system may be taken out of service and filled with "firewater" (approximately 40,000 gallons), which will be discharged. This takes place approximately once per month for approximately 9 hours. Effects on the receiving water, etc. are monitored. In addition, the plant may discharge low levels of chemical wastes, low-level radioactive wastes (treated and sampled for compliance with discharge limits) and stormwater runoff. Leakages could occur from operation, maintenance and testing.

Power plants may also entrain jellyfish through their intake system, although because entrainment may be detrimental to the operation of the plant, power plants likely have methods to reduce or remove jellyfish (e.g. see write-up on individual power plant operations below). The effects of entrainment on prey resources are likely very localized and affect a small proportion of the coastal population of jellies. The effects of power plants is unclear, as Purcell et al. (2007) report that structures associated with coastal power plants may serve as substrate for the polyp stage of jellyfish, which may contribute to increases in jellies, thus a benefit to the prey PCE in leatherback habitat. .

Most plants do have a spill prevention control and countermeasure plan so concerns over possible oil spills or pollution into the water are minimal.

2.4.2 Regulatory Environment and Extent of Activity

The Nuclear Regulatory Commission regulates commercial nuclear power plants and other uses of nuclear materials, such as in nuclear medicine, through licensing, inspection and enforcement of its requirements. The California Energy Commission has multiple duties, such as: licensing thermal power plants 50 megawatts or larger and planning for and directing state response to energy emergencies.

This analysis uses data provided by the California Energy Commission, to identify power plants that could be affected by the proposed critical habitat designation.[29] There are no nuclear power plants within the coastal counties in Washington or Oregon. The Diablo Canyon Power Plant, which is located in San Luis Obispo County, CA near Avila Beach, is the only nuclear power plant within the proposed area of critical habitat (Area 7). This power plant may affect prey resources due to discharges of up to one million gallons of sea water for use in cooling its main condenser. As noted above, this water may be higher than the ambient water temperatures and therefore may affect jellyfish survivability, recruitment into benthic habitat, and development, as well as prey resources (e.g. mesozooplankton, fish larvae, etc.) although there is some evidence of warmer water causing increases in jellyfish blooms, so the effect of the warmed water may be either negative or positive for jellyfish that are the primary prey of leatherbacks.. The cooling water discharge is into Diablo Cove. In order to control biofouling, part of the auxiliary salt water system may be taken out of service and filled with "firewater" (approximately 40,000 gallons), which will be discharged – this takes place approximately once per month for approximately 9 hours – effects on the receiving water, etc. are being monitored. In addition, the plant may discharge low levels of chemical wastes, low-level radioactive wastes (treated and sampled for compliance with discharge limits) and stormwater runoff. Leakages could occur from operation, maintenance and testing. The plant does have a spill prevention control and countermeasure plan.

Diablo Canyon Power Plant (DCPP)

DCPP is owned and operated by Pacific Gas and Electric Company (PG&E), and is a nuclear-powered, steam-turbine power plant with a rated output of 2,200 MW of electricity. The power plant draws in seawater from a constructed intake cove through a cooling water system to provide cooling for power plant operations. Four circulating water pumps combine to produce a cooling water flow of 1,704,000 gpm. On the ocean side of the intake structure, a concrete curtain wall extends approximately 2.4 m below mean sea level to prevent floating debris from entering the structure. Seawater entering the intake structure passes through one of 16 sets of bars racks designed to exclude large debris from the forebays. The bar racks consist of vertical rows of steel bars placed about 8.0 cm apart. The underwater portion of the bar racks is approximately 10 m high depending on tide. Two of the bar racks are 1.5 m wide (ASW bar racks), while the other 14 are 3.1 m wide (CWP bar racks).

The cooling water is returned to the ocean via stair-step weir structure that opens on the eastern end of Diablo Cove.

[29] California Energy Commission. *California Statewide Plants map*. Accessed at: http://www.energy.ca.gov on April 20, 2008.

The activities of non-nuclear power plants, while not managed by a federal agency, may still be subjected to a Section 7 consultation. For example, 11 non-nuclear power plants off the coast of California have applied for a "Letter of Authorization" under the MMPA to take pinnipeds incidental to their operations (entrainment of marine mammals in their intake structures, causing serious injury/mortality). In addition, these power plants may entrain sea turtles, and as such, 7 non-nuclear power plants have applied for a Section 10 permit under the ESA to take sea turtles. Because NMFS has proposed to issue these permits to the non-nuclear power plants, a Section 7 consultation is in the process of being conducted on NMFS' action, a federal action. At this point, whether this Section 7 consultation would include an analysis of the effects of the cooling water discharge on potential leatherback critical habitat is unclear, but because there is a potential federal nexus, we are including non-nuclear coastal power plants.

The following is a list and brief description of the coastal power plants in California. There are no power plants located along the coasts of Oregon and Washington.

AREA 1

There is only one non-nuclear coastal power plant located in Area 1, the Moss Landing Power Plant.

Moss Landing Power Plant (MLPP)

The MLPP is a 2,590-MW facility located on the eastern shoreline of Moss Landing Harbor in Monterey County, California, about 177 km south of San Francisco. Moss Landing Harbor is located approximately midway between the cities of Santa Cruz and Monterey and is open to Monterey Bay. The MLPP has two separate intake structures in Moss Landing Harbor for withdrawal of cooling water that is necessary to remove excess heat from the power generating process. The intake that services the newly operational Units 1 and 2 (2002) was modernized from its original configuration after the original Units 1 through 5 were retired (1995). A second intake structure services operating Units 6 and 7. The total flow of cooling water is approximately 850,000 gpm. Discharge from all the Units is carried out of the plant in two 3.66-m ID subsurface conduits located in Monterey Bay 731 m from the plant, about 183 m offshore.

AREA 7

There are five non-nuclear coastal power plants located in Area 7. A description of their operations is provided below.

Morro Bay Power Plant (MBPP)

The MBPP is a 1,030-MW facility owned located within the city of Morro Bay, San Luis Obispo County, California, near the eastern shore of Morro Bay Harbor. MBPP is proposed for modernization involving the replacement of the existing four steam-electric generation units (Units 1 through 4) with two state of the art combined cycle systems composed of two gas turbines and a steam turbine each. The modernized facility will have a smaller physical footprint, will utilize substantially less cooling water, and will produce more electrical power than the existing facility. The CWS for the plant consists of an intake structure which draws water from Morro Bay and an outfall structure which discharges water into Estero Bay (Pacific Ocean). The existing seawater intake structure located on the east shore of Morro Bay Harbor houses 8 cooling water pumps (two pumps per unit) and related auxiliary equipment and provides cooling water to the condensers of the four existing units. The current capacity of the CWS is 464,000 gpm, which would be reduced to 330,000 gpm following modernization. Should the plant be modernized in the future as proposed, the combined cycle units will utilize the existing intake structure though the traveling screens and pumps will be reconfigured.

Cooling water is returned to the ocean via a canal supplied by three separate underground tunnels. Units 1 and 2 share a common cooling water discharge tunnel that runs about 1,080 m from the condensers to a short 84 m outfall canal on Estero Bay just north of Morro Rock. Units 3 and 4 each have separate, parallel 1,230 m long discharge tunnels that also discharge into the outfall canal on Estero Bay.

Reliant Energy Mandalay Generating Station (REMGS)

REMGS is a 577 MW-facility owned located on the southern California coast approximately 4.8 km west of the city of Oxnard. The plant consists of two steam-electric generating units, each rated at 215 MW, and one gas turbine unit rated at 147 MW.

Ocean water for cooling purposes is supplied via a single cooling water system. Cooling waster is drawn into the plant through Edison Canal, which originates approximately 4.2 km away at the northern end of Channel Islands Harbor in Oxnard, California. The capacity of the CWS is 176,000 gpm. Four circulating water pumps with a total capacity of 176,000 gpm direct cooling water flow to a screening facility within the plant. Water passes through trash bars and vertical sliding screens which prevent debris, fish, and invertebrates from entering the CWS. The trash bars consist of vertical steel bars with 5.7 cm openings which prevent large debris from moving further through the CWS. Beyond the trash racks, the water is conveyed through two sets of vertical sliding screens with 0.95 cm mesh for removal of small debris, fish, and macro-invertebrates.

The cooling water is then pumped to four horizontal centrifugal circulating pumps set in a dry well. Leaving the pumps, water flows to the main condensers through four 1.4 m ID pipes. Flows from the condensers are then joined in a 2.7 m ID discharge pipe, and then into a 61.0 m long rock-lined canal, where it flows across the beach at a velocity of 0.8 m/s into the ocean. Products of other plant systems join the cooling water stream prior to discharge.

Reliant Energy Ormond Beach Generating Station (OBGS)

Reliant Energy Ormond Beach Generating Station (OBGS) is a two-unit, 1,500 MW gas-fueled, steam-electric generating facility located near Oxnard, California. Ocean water for cooling purposes is supplied via a single cooling water system. The facility consists of two gas-fueled steam-electric units fed with cooling water via the CWS. Four circulating water pumps operate with a total capacity of 476,000 gpm.

The intake structure is located 631 m offshore at a depth of 10.7 m. Once the ocean cooling water enters the intake tunnel, the flow velocity is about 2.1 m/s (4.1 knots) during normal plant power operations. The cooling water is then directed through trash bars and vertical traveling screens which prevent debris, fish, and invertebrates from entering the CWS. The trash bars consist of vertical steel bars with 11.4 cm openings. Beyond the trash racks, the water is conveyed through four traveling screens with 1.6 cm mesh for removal of small debris, fish, and macro-invertebrates. Debris, fish, and invertebrates are removed from the screens by high-pressure sprays and conveyed to trash baskets for disposal.

Warmed cooling water is discharged offshore the generating station approximately 174 m inshore of the intake structure. The discharge structure is located in approximately 9.0 m of water. Products of other plant systems join the cooling water stream prior to discharge.

El Segundo Generating Station (ESGS)

ESGS is a 1,020 MW facility located in the City of El Segundo and utilizes two intake structures (individual structures for Units 1 and 2 and for Units 3 and 4) as part of the facility's once through cooling system. The intake structures consist of two pipes that extend 790 m offshore into Santa Monica Bay and are each topped with a velocity cap. The maximum flow through the intake for Units 1 and 2 is 144,000 gpm and the maximum for Units 3 and 4 is 276,000 gpm.

There are also two separate outfall pipes (one for Units 1 and 2 and one for Units 3 and 4) located in Santa Monica Bay with the depth of the outfall for Units 1 and 2 at 8.5 m and the depth for Units 3 and 4 at 9.1 m (both measured at a tide level of mean lower low water).

Redondo Beach Generating Station (RBGS)

RBGS is a 1,310-MW facility located in the city of Redondo Beach and consists of 8 fossil-fueled steam-electric generating units. There are three intake structures which provide cooling water to the 8 units. In 1987, four of the units and one of the intake structures were taken offline. The two remaining intakes supply Units 5 and 6 and Units 7 and 8, respectively, and draw in approximately 176,000 – 468,000 gallons of sea water per minute (gpm). After reaching the forebay the cooling water is directed through trash bars and vertical traveling screens with 0.95 cm mesh, which prevents debris, fish, and invertebrates from progressing further through the CWS. The warmed cooling water is joined with products of other plant systems and returned to the ocean via discharge conduits. The discharge for Units 5 and 6 is located 445 m offshore, just outside the King Harbor breakwater. Units 7 and 8 discharge effluents 45 m offshore within King Harbor.

2.4.3 Impacts of Critical Habitat Designation on Power Plants

Designation of leatherback critical habitat could, through a section 7 consultation, result in the imposition of modifications related to power plant operations, such as:

- Require cooling of thermal effluent before release to the environment (may require use of different technology).
- Require treatment of any contaminated waste materials.
- Modifications associated with permit issued under NPDES (any updates from current early 1990s issuance).

This analysis focuses on costs related to temperature control criteria and assumes that costs to power plants would be similar to those of major NPDES facilities, which are explained in Section 2.1.3.

2.4.4 Summary of Economic Impacts to Power Plants by Area

Table 2.4-1 presents a summary of potential impacts to power plants. Area 7 has considerably higher costs than area 1, due to the number of existing power plants.

Table 2.4-1: Summary of Economic Impacts to Power Plants by Area

Area	Activity Count (Estimated number of power plants)	Incremental Score	Total Annualized Impacts (Discounted at 7 %)		
			Low	Mid	High
1	1	0.3	$14,400	$19,200	$24,000
7	6	0.3	$86,100	$115,200	$144,300
Total			$100,500	$134,400	$168,300

2.5 Economic Impacts of Critical Habitat Designation on Desalination Plants

2.5.1 Description of Threat

NMFS has identified desalination plants as a potential threat in two areas: Areas 1 and 7. Desalination plants may pose a threat to leatherback critical habitat by affecting jellyfish prey. It is possible for "…marine life to become trapped on screens at the feed water intake (impingement) or sucked into the feed water system (entrainment)."[30] Impingement or entrainment of jellyfish could result in localized and temporary detrimental impacts on this PCE. Also, the discharge of hypersaline water could affect jellyfish; however, any effects would likely be localized due to dilution and may have both beneficial and detrimental impacts.

The California Coastal Commission has found that the desalination process results in an effluent that is high in salts and may contain various contaminants such as chemicals or cleaning compounds.[31] The discharge also carries with it what may be a large volume of biomass made up of the entrained organisms that were drawn through the facility. There are also likely to be other types of impacts when desalination discharges are combined with other discharge from coastal power plants, wastewater treatment facilities, or others types of facilities. However, there have been known beneficial impacts from desalination plants on jellyfish. Xian et al. (2005) has noted "At the water storage stage, the discharge of water and sediments into estuary is greatly reduced, making the saltwater intrusion appear earlier and the duration of intrusion longer. The increase of water temperature and salinity, the high level of nutrients, and the abundance of zooplankton has stimulated the expansion of Cyanea capillata, from a prevalence of 0.41% in 1998 to 85.47% of the total samplings for fisheries in November 2003."[32]

2.5.2 Regulatory Environment & Extent of Activity

The USCG is responsible for approving structures in navigable waters, such as intake and outfall pipelines, to ensure they don't adversely affect navigation. The Coast Guard may also require buoys or markers to be maintained over the structures. The applicant may also be required to submit information about the structures to include on nautical charts.

U.S. Army Corps of Engineers: A desalination facility may require a Section 404 permit from the U.S. Army Corps of Engineers if it involves placing fill in navigable waters, and a Section 10 permit if the

[30] California American Water. *Seawater Desalination: White Paper*. September 2004. Accessed at: http://www.coastalwaterproject.com/pdf/WhitePaper_SeawaterDesalination.pdf on April 1, 2009.
[31] California Coastal Commission. *Seawater Desalination and the California Coastal Act*. Accessed at: http://www.coastal.ca.gov/energy/14a-3-2004-desalination.pdf on April 1, 2009.
[32] Xian et al. (Jan. 2005) "Jellyfish Blooms in the Yangtze Estuary," Science, vol. 307.

proposal involves placing a structure in a navigable waterway. Facilities may require review from NMFS and/or U.S. Fish and Wildlife Service for their potential effects on endangered threatened or other sensitive species. They may also require review for effects on EFH, protected marine mammals, and migratory birds. Other permits may also be required from the Federal Bureau of Reclamation, Environmental Protection Agency (e.g., NPDES permit), Minerals Management Service, etc.

The available consultation data upon which we based our analysis does not indicate that NMFS or the Fish and Wildlife Service had consulted on past desalination projects regarding impacts on listed marine species. Further, existing desalination plants do not appear to have implemented measures to manage the discharge of hypersaline effluent for human protection or otherwise, to date. Discharges from desalination plants are subject to Clean Water Act (CWA) requirements, but because there is no past consultation history, it is not clear whether CWA requirements adequately address hypersaline effluent in marine waters for jellyfish.

There are eleven existing coastal desalination plants located within the proposed critical habitat area (see Table 2.5-1). Two of these plants are not currently operating and the City of Morro Bay has a temporary emergency desalination plant that is not currently in operation.[33] Because water produced via desalination tends to be more expensive than water from other sources, the operating status of a plant is highly dependent on prevailing drought conditions and local water prices. As water from other sources becomes scarce, desalination becomes a more viable source of drinking water, and desalination plants may be brought online. Twenty-one additional desalination plants have been proposed but have not yet been constructed (see Table 2.5-1 and Figure 2.5-1). Generally, the proposed plants have greater capacities than existing plants, suggesting that these plants may produce a greater quantity of hypersaline effluent. Similar to LNG terminals and tidal/wave energy projects, it is unclear how many projects may ultimately reach construction stage.

[33] California Coastal Commission. *Chapter Two: Coastal Desalination Projects in California*. Accessed at: http://www.coastal.ca.gov/desalrpt/dchap2.html.

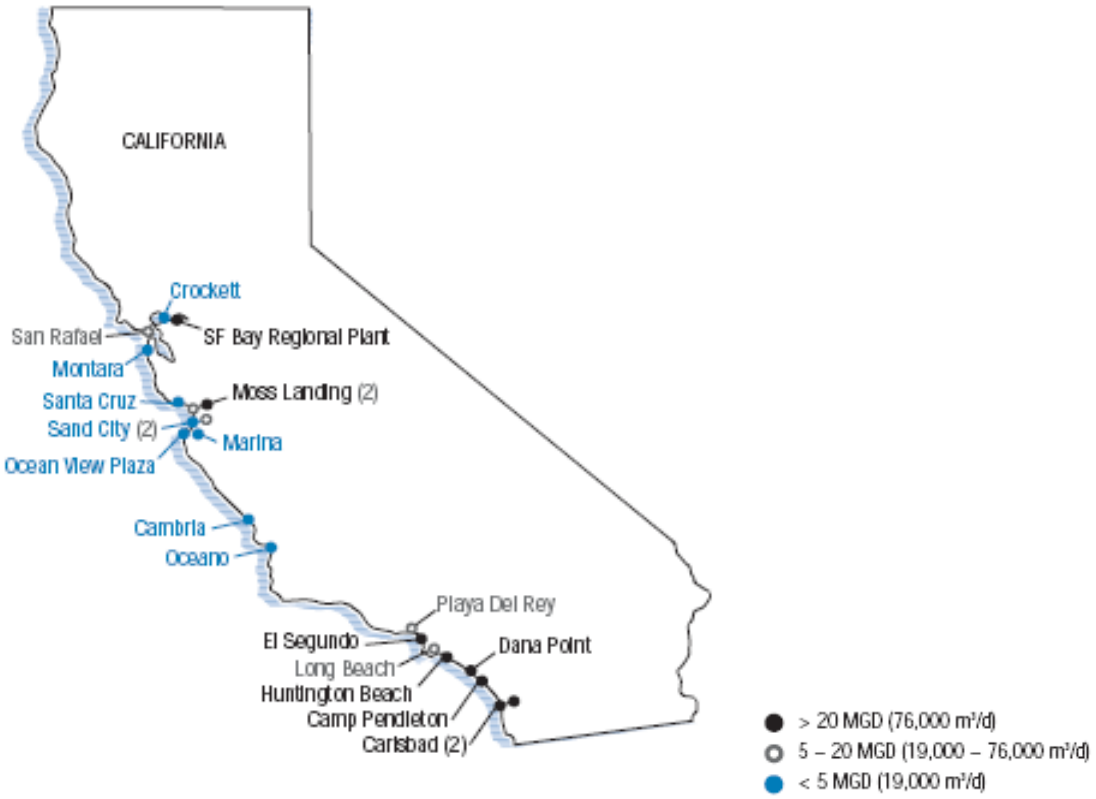
Table 2.5-1: Number of Desalination Plants in California Affected Areas

County	Area	Project Name/(Ownership)	Capacity (MGD)	Status
Existing				
Santa Barbara	7	Chevron Gaviota Oil and gas Processing Plant/(Private)	0.4	Active
Santa Barbara	7	City of Santa Barbara/(Public)	2.8	Decommissioned
Monterey	1	Duke Energy/Moss Landing/(Private)	0.5	Active
Monterey	1	Marina Coast Water District/(Public)	0.3	Temporarily idle
Monterey	1	Monterey Bay Aquarium/(Non-profit)	0.04	Active
San Luis Obispo	7	Duke Energy/Morro Bay/(Private)	0.4	Not known
San Luis Obispo	7	City of Morro Bay/(Public)	0.6	Intermittent use
San Luis Obispo	7	PG&E/Diablo Canyon/(Private)	0.6	Not known
LA	7	Santa Catalina Island/(Public)	0.1	Inactive
LA	7	U.S. Navy/Nicholas Island/(Government)	0.02	Not known
Nine Locations[34]	Some in 1, 7	Oil and gas companies -located at offshore oil and gas platforms/(Private)	0.002-0.03	Active
Proposed				
Marin	1	Marin Municipal Water District	10-15	
SF	1	San Francisco Public Utilities Commission/ Contra Costa Water District/ Santa Clara Valley Water District	20-80	
SF	1	East Bay Municipal Utility District	1.5	
San Mateo	1	Montara Water and Sanitary District	N/A	
Santa Cruz	1	City of Santa Cruz	2.5-4.5	
Monterey	1	California American Water Company	11-12	
Monterey	1	Pajaro-Sunny Mesa/Poseidon	20-25	
Monterey	1	City of Sand City	0.3	
Monterey	1	Monterey Peninsula Water Management District	7.5	
Monterey	1	Marina Coast Water District	1.3	
Monterey	1	Ocean View Plaza	0.05	
San Luis Obispo	7	Cambria Community Services District/ Department of the Army	0.4	
San Luis Obispo	7	Arroyo Grande/Grover Beach/ Ocean Community Services District	1.9	
Los Angeles	7	Los Angeles Department of Water and Power	12-25	
Los Angeles	7	West Basin Municipal Water District	20	
Los Angeles	7	Long Beach Water Department	8.9	

Source: Cooley, Heather, Peter H. Gleick, and Gary Wolff. 2006. "Desalination, with a Grain of Salt: *A California Perspective*." Pacific Institute for Studies in Development, Environment, and Security. Accessed at: www.pacinst.org/reports/desalination/desalination_report.pdf on March 24, 2009.

[34] California Coastal Commission. *Seawater Desalination in California*. Accessed at: http://www.coastal.ca.gov/desalrpt/dsynops.html on April 14, 2009. This analysis makes the assumption that these nine locations are located equally in areas 1, 7 or 8 due to lack of information.

Figure 2.5-1: Proposed Desalination Plants in California (2006)



Source: Cooley, Heather, Peter H. Gleick, and Gary Wolff. 2006. "Desalination, with a Grain of Salt: *A California Perspective*." Pacific Institute for Studies in Development, Environment, and Security. Accessed at: www.pacinst.org/reports/desalination/desalination_report.pdf on March 24, 2009.

2.5.3 Impacts of Critical Habitat Designation on Desalination Plants

Leatherback critical habitat could impose modifications related to desalination plants, such as:

- Avoiding or minimizing entrainment and impingement impacts. The California Coastal Commission (2004) lists ways this can be accomplished:
    - Use alternative designs and mitigation measures to avoid intake.
    - By using a subsurface intake, such as a beach well or infiltration gallery, which would allow these impacts to be avoided entirely.
    - Where subsurface intakes are infeasible, open water intakes may be designed and located so that entrainment and impingement are reduced, but usually not entirely eliminated.
- Avoid or minimize adverse effects caused by desalination discharges. Yet again, The California Coastal Commission (2004) lists ways this can be accomplished:
    - Proper location
    - Subsurface outfalls

- Structural measures – diffusers or multiport outfalls
- Minimizing chemical use or using alternative treatments
- Wastewater treatment systems or on-land disposal
- Co-located or combined outfalls

Under Clean Water Act requirements, desalination plants require Federal permits from USACE, EPA, or both. Therefore, should critical habitat be designated for leatherbacks in areas where these plants operate, a section 7 consultation may be required to determine impacts. Potential conservation efforts to mitigate desalination impacts are likely to include the treatment of hypersaline effluent to ensure that salinity levels are restored to normal values. The costs of treating hypersaline effluent or finding an alternate manner of brine disposal can vary widely across plants depending on plant capacity and design. Therefore, this analysis presents a range of possible impacts.

At the low end, this analysis assumes that the cost of reducing salinity levels will be minimal. For example, desalination plants may be co-located with power plants. If co-located, the effluent can be mixed with the power plants' wastewater to reduce salinity at minimal cost. Many desalination plants already choose to be co-located with power plants because co-location can result in construction and energy cost savings.[35]

At the high end, it assumes that desalination plants would utilize alternate methods of brine disposal. These alternate methods can include using injection wells, evaporation ponds, or crystallizers. The estimated costs of brine disposal using injection wells (the least cost alternative at approximately $0.63 per kilogallon in $2009[36]) are presented in Table 2.5-2.

[35] Poseidon Resources, "Desal 101." Accessed at: http://www.poseidonresources.com/desal_101.html on June 1, 2009.

[36] U.S. Department of the Interior Bureau of Reclamation. 2006. *Desalination and Water Purification Research and Development Program Report No. 111: Zero Discharge Seawater Desalination: Integrating the Production of Freshwater, Salt, Magnesium, and Bromine*. Reclamation: Managing Water in the West. University of South Carolina Research Foundation Agreement No. 98-FC-81-0054; adjusted for inflation using Bureau of Labor Statistics "Inflation Calculator" accessed at http//www.bls.gov on May 4, 2009.

Table 2.5-2: Estimated Costs of Alternative Method of Brine Disposal

Area	Number of Plants	Capacity (kgal/year)	Annual Cost	Average Annual Cost per Plant
1	17	44,361,370	$27,947,700	$1,552,600
7	15	19,953,820	$12,570,900	$838,000

Notes: Assumes brine is disposed in injection wells. Assumes, on average, costs of $0.63/kgal for alternative brine disposal.
Source: U.S. Department of the Interior Bureau of Reclamation. 2006. *Desalination and Water Purification Research and Development Program Report No. 111: Zero Discharge Seawater Desalination: Integrating the Production of Freshwater, Salt, Magnesium, and Bromine*. Reclamation: Managing Water in the West. University of South Carolina Research Foundation Agreement No. 98-FC-81-0054.

2.5.4 Summary of Economic Impacts to Desalination Plants by Area

As discussed above, potential impacts on desalination plants are subject to high levels of uncertainty for the following reasons:

- The number of future desalination plants is speculative
- Future management and required project modifications for desalination are uncertain and could vary depending on the location and size of the plant.

Table 2.5-3 presents a summary of our findings. Areas 1 and 7 have similar costs, since the total number of desalination projects considered are 17 and 15, respectively for areas 1 and 7.

Table 2.5-3: Summary of Economic Impacts of Desalination Projects by Area

Description	Number of Affected Plants		Incremental Score	Total Annualized Costs (Discounted at 7%)		
	Existing	Proposed		Low	Mid	High
1	6	11	0.3	$0	$217,650	$435,300
7	10	5	0.5	$0	$195,800	$391,600
Total				$0	$413,450	$826,900

2.6 Economic Impacts of Critical Habitat Designation on Tidal & Wave Energy Projects

2.6.1 Description of Threat

NMFS has identified tidal and wave energy projects as potentially affecting areas considered for leatherback critical habitat in areas 1, 3 and 7. Tidal and wave-energy projects are designed to harness the kinetic energy of waves, currents, or tides to generate electricity. These projects typically involve placement of structures, such as buoys, cables, and turbines, in the water column. Projects can vary greatly in terms of size and design, and most are not yet fully developed. The exact nature of habitat impacts is difficult to predict; however, possible impacts to features of the proposed leatherback critical habitat include obstruction of passage or migration and disturbance to prey species during their benthic,

polyp stage. It is unknown whether the passage PCE could also be affected by the electromagnetic fields (EMF) generated by these types of projects. EMFs have been shown to impact nervous system function in many species and could potentially impact the ability of leatherbacks to orient and navigate. However, these effects are likely to attenuate quickly with distance away from the source of the electromagnetic field. Effects on the habitat features as a result of project construction and operation will undoubtedly vary based on the particular project and project location. As mentioned above, offshore wind energy projects were not evaluated in this analysis due to lack of data and uncertainty of information. Offshore wind energy does not currently exist off of the U.S. West Coast.

2.6.2 Regulatory Environment & Extent of Activity

Because tidal and wave energy projects in leatherback habitat on the West Coast are in the preliminary stages of development, NMFS has yet to make specific recommendations about project modifications that may be required to mitigate potential adverse impacts on listed species and/or their designated critical habitat. Tidal and wave energy projects have the potential to affect the habitat of a wide range of species, including green sturgeon, Pacific salmon and steelhead, and marine mammal species. Again, due to the preliminary stages of permitting for most projects, NMFS has made few conservation recommendations related to these projects for these species. Nonetheless, some level of baseline protection is thought to exist for these species under the ESA.

Tidal and wave energy projects are subject to FERC permitting and licensing requirements, and thus may require section 7 consultations on impacts to listed species and critical habitat. Both NMFS and the U.S. Fish and Wildlife Service have commented on several of the preliminary permit applications for these projects. In its comments, NMFS noted affected areas that represent essential fish habitat (EFH) for federally managed species under the Magnuson Stevens Fishery Management Act, but indicated that the breadth and magnitude of potential adverse impacts on this habitat are unknown and cannot be evaluated without further information on and analysis of the specific projects at issue.[37] Among other environmental statutes applicable to proposed or pilot projects are section 401 of the Clean Water Act and the Marine Mammal Protection Act. A proposed project would also likely require a finding of consistency by the relevant state under section 307 (c) of the Coastal Zone Management Act to ensure the project complies with the state's coastal zone management plan.

[37] See, for example, National Marine Fisheries Service. *Comments on San Francisco Bay Tidal Energy Project* (FERC No. 12585), August 12, 2005.

To date, 8 projects within the identified areas have received preliminary permits from the Federal Energy Regulatory Commission (FERC). Seven of these projects fall within Area 3 and one project is within Area 7. Preliminary permits are issued for up to three years and allow the permit-holder priority to develop that site for the duration of the permit. Preliminary permits, however, do not authorize any construction. In order to construct and operate a hydrokinetic facility, a license must be issued by FERC. There was one licensed project within the study area called the Makah Bay Wave Pilot Project, located in Area 2; however, in February 2009, this license was surrendered and the project is no longer being pursued.

A list of hydrokinetic projects proposed within the study area is presented in Table 2.6-1 and is based on review of information posted at www.ferc.gov as of June 29, 2009:

Table 2.6-1: Issued and Pending Preliminary Permits Issued by FERC for Tidal and Wave Energy Projects

Area	Project #	Project Name	Water Body	Applicant	Filing Date	Issued Date	Classification
Issued Preliminary Permits							
7	P-13052	Green Wave San Luis Obispo Wave Park	Pacific Ocean	Green Wave Energy Solutions, LLC	10/19/2007	5/07/2009	Wave
3	P-13053	Green Wave Mendocino	Pacific Ocean	Green Wave Energy Solutions, LLC	10/19/2007	5/01/2009	Wave
3	P-13075	Centerville OPT Wave Energy Park	Pacific Ocean	California Wave Energy Partners, LLC	11/9/2007	6/27/2008	Wave
3	P-12781	Mendocino County WaveConnect	Pacific Ocean	PG & E	2/27/2007	3/13/2008	Wave
3	P-12779	Humboldt County WaveConnect	Pacific Ocean	PG & E	2/27/2007	3/13/2008	Wave
3	P-12749	Douglas County	Pacific Ocean	Douglas County	6/15/2006	4/6/2007	Wave
3	P-12749	Coos Bay	Pacific Ocean	Oregon Wave Energy Partners I, LLC	3/27/2006	3/9/2007	Wave
3	P-12713	Reedsport OPT Wave Park	Pacific Ocean	Ocean Power Technologies, Inc.	3/29/2006	2/16/2007	Wave
Pending Projects							
1	P-13376	Del Mar Landing Project	Pacific Ocean	Sonoma County Water Agency	2/26/2009	N/A	Wave
1	P-13377	Fort Ross South Project	Pacific Ocean	Sonoma County Water Agency	2/26/2009	N/A	Wave
1	P-13378	Fort Ross South Project	Pacific Ocean	Sonoma County Water Agency	2/26/2009	N/A	Wave
1	P-12585-001	San Francisco Bay Tidal Energy Project	San Francisco Bay	Golden Gate Energy Company	10/1/2008	N/A	Tidal - Current
Licensed Project – License Surrendered in 2/2009							
2	P-12751	Makah Bay Offshore Wave Pilot Project	Pacific Ocean	Finavera Renewables Ocean Energy, Ltd	11/6/06	12/21/07	Wave

Source: Federal Energy Regulatory Commission**.** *Issued and Valid Hydrokinetic Projects Preliminary Permit*. Accessed at: http://www.ferc.gov/industries/hydropower/indus-act/hydrokinetics/permits-issued.asp on June 30, 2009; Federal Energy Regulatory Commission. *Pending Hydrokinetic Projects Preliminary Permits*. Accessed at: http://www.ferc.gov/industries/hydropower/indus-act/hydrokinetics/permits-pending.asp on June 30, 2009.

2.6.3 Impacts of Critical Habitat Designation on Tidal & Wave Energy Projects

The technology for hydrokinetic projects is relatively new and is still being actively developed. It is not yet known what number of the proposed projects will be constructed and become operational. Thus the ultimate design, location, and impacts of these projects are difficult to predict. Project modifications that would be required to minimize impacts to leatherback critical habitat are similarly difficult to predict and quantify. Based on NMFS consultations on several pilot projects, project modifications could include installation of covers on turbines, installation of sampling gear, and biological monitoring.[38] Should EMF impacts be found, armoring and trenching of cables and shielding of infrastructure may be required; however, these measures are not certain to be effective and are unlikely to be required in most situations. Potential modifications to these projects to mitigate adverse impacts may include spatial or temporal restrictions on project installation, operation, and maintenance. In the absence of specific conservation efforts recommended for listed species, the potential impact of leatherback critical habitat, should it be designated, on tidal/wave energy project remains uncertain.

Data on the costs of these measures were not widely available. To develop an estimate of potential costs, this analysis relies on the estimated costs of environmental measures for a single project, and assumes that these costs will be incurred by all tidal/wave energy projects (see Table 3-4). We recognize that this sample is small, and thus large uncertainties exist with respect to estimated potential impacts to these projects. In addition, FERC points out in the "Economic Analysis of the Impacts of Designating Critical Habitat for the Threatened Southern Distinct Population Segment of North American Green Sturgeon (NMFS 2008)" that license application costs and costs related to environmental review of the projects may increase due to critical habitat designation. While costs of section 7 consultation are discussed in Section 1 of this report, other environmental review costs are not explicitly captured in current estimates. To the extent that future projects require more or fewer project modifications than have been included in this example, these costs may over- or underestimate economic effects. We solicit additional data and comments from the public regarding potential modifications and associated economic costs related to tidal- and wave- energy projects that may occur as a result of a critical habitat designation, as well as on the consultation costs discussed in Section 1.

[38] See, for example, Keys Hydro Tidal Turbine Experiment at Bahia Honda Channel Biological Monitoring Plan.

Table 2.6-2: Environmental Measures for Example Wave Energy Project

Project Modification	Capital Cost	Annual O&M Cost	Total 30 yr Cost
Use horizontal directional drilling to deploy transmission cable from shore station under beach and intertidal area, out to depth of 10 to 30 ft below mean lower low tide (2005$)	$500,000	0	$500,000
Design features to achieve a closed-loop system to prevent any marine life entering pressurized water flow (2005$)	$500,000	$20,000	$1,100,000
Design features to minimize scale of anchor devices, project footprint on seafloor, and chain/cable sweep of seafloor (2005$)	$250,000	0	$250,000
Develop a schedule of regular system maintenance that minimizes site visits, disturbance to marine growth, and activity at the site. (2005$)	2500	$500	$17,500
		Total	$1,867,500
		Total (2009$)	$2,029,000
		Annual Cost	$67,600
Source: Cost estimates from Economic Analysis of the Impacts of Designating Critical Habitat for the Threatened Southern District Population Segment of North American Green Sturgeon, August 27, 2008, prepared for NMFS and adjusted for inflation using the Bureau of Labor Statistics Inflation Calculator.			

2.6.4 Summary of Economic Impacts to Tidal/Wave Energy Projects by Area

As discussed above, potential impacts on tidal and wave energy projects are subject to high levels of uncertainty for the following reasons:

- The number of future tidal and wave energy projects is speculative.
- Future management and required project modifications for leatherback critical habitat, should it be designated, related to tidal and wave energy projects are uncertain and could vary in scope from project to project.

Table 2.6-3 presents a summary of our findings. Area 3 has the highest costs due to the number of issued preliminary permits. Area 7 has low costs since the analysis considers only one pending project in this area.

Table 2.6-3: Summary of Economic Impacts to Tidal/Wave Energy Projects by Area

Area	Issued Preliminary Permits	Pending Projects	Incremental Score	Total Annualized Costs (Discounted at 7%)
1	0	4	0.5	$135,200
3	7	0	0.5	$236,600
7	0	1	0.5	$33,800
Total				$405,600

2.7 Economic Impacts of Critical Habitat Designation on Liquefied Natural Gas Projects

2.7.1 Description of Threat

NMFS identified proposed liquefied natural gas (LNG) projects as a potential threat to leatherback critical habitat in Areas 2, 3, 7 and 8. Several environmental issues have been identified with the construction and operation of LNG terminals, including cold water discharge, leaks and spills, release of anti-fouling chemicals into the water, disturbance of benthic habitat and noise. Cold water discharge associated with regasification could have impacts on prey resources if the discharge is significantly cooler than ambient water. Leaks, spills, and release of contaminants could affect water quality, but effects on the proposed PCEs are not known. Dredging and filling associated with construction and maintenance (to allow tanker passage) could have impacts on benthic habitat and possibly the early life stages of leatherback prey resources. Noise associated with construction has not been determined to cause impacts to the proposed PCEs associated with leatherback habitat.

2.7.2 Regulatory Environment & Extent of Activity:

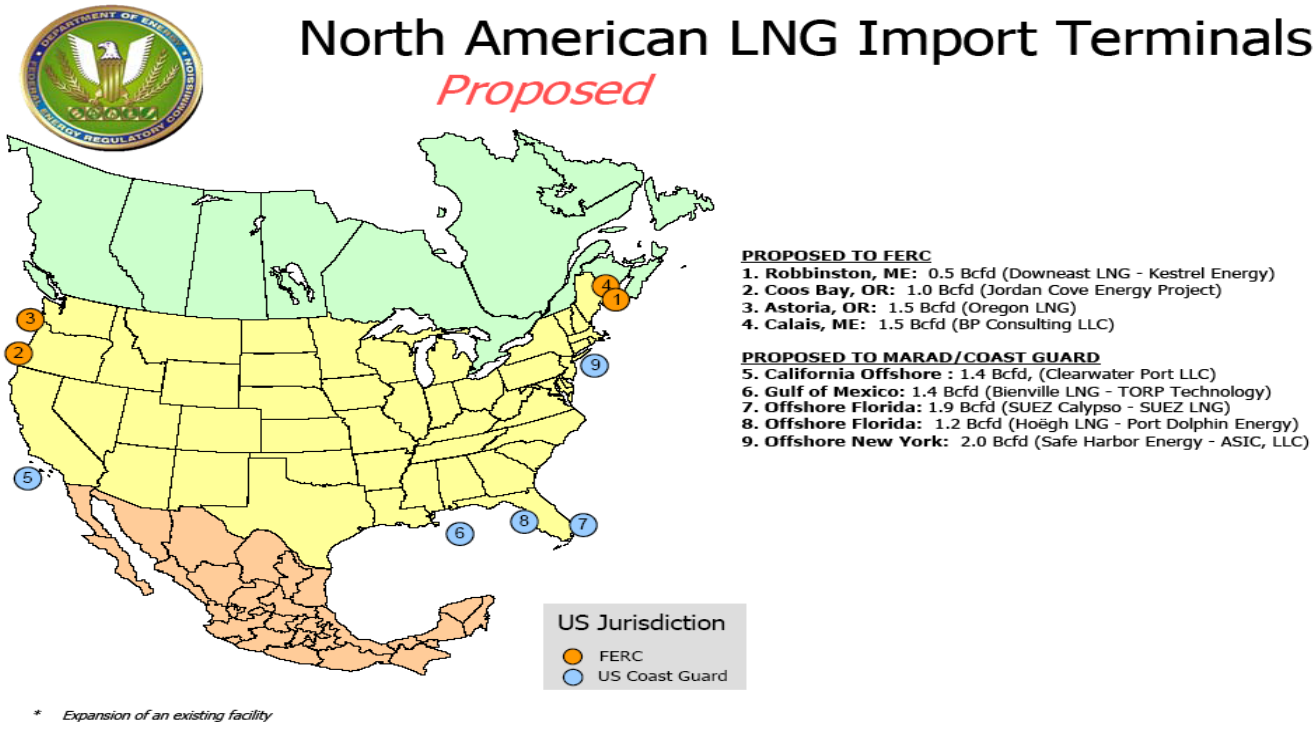
Depending on the proximity of the facility to shore, LNG projects are subject to either FERC or Coast Guard permitting and licensing requirements and thus may require ESA section 7 consultations. Depending on the particular project design and operations, Clean Water Act permits under section 401 (water quality certificate) and/or section 404 (a dredge and fill permit) and Clean Air Act permits under section 502 may be required from the relevant state. A proposed project would likely also require a finding of consistency by the relevant state under section 307 (c) of the Coastal Zone Management Act to ensure the LNG project complies with the state's coastal zone management plan. During operations, LNG facilities must comply with federal safety standards (49 CFR 193) and regulations for waterfront facilities (33 CFR 127).

Based on review of FERC's database [39] updated as of February 6, 2009, there are no approved and only three proposed LNG facilities within the study areas. These projects are still in the development stages, and are awaiting approval from FERC and/or the U.S. Coast Guard (depending on their location). Three potential projects within the identified areas along the California coast are also being discussed by the industry; however, these projects may never be proposed to FERC (see figures 2.7-1, 2.7-2 and table 2.7-1 below for more details).

[39] FERC, accessed online April 15, 2009 at http://www.ferc.gov/industries/lng.asp. Updated as of February 6, 2009

It is difficult to predict the number and location of LNG facilities that will be built within the areas being considered for critical habitat of leatherbacks. In addition to a rigorous approval process, many of these projects face significant local opposition as has been witnessed in the Pacific Northwest or are abandoned during the development stages for various reasons. FERC's website indicates that market forces will ultimately dictate the number of facilities constructed; analysts project that about 30% (12) of the 40 LNG terminals currently being considered will ever be built (www.ferc.gov).

Figure 2.7-1 Proposed North American LNG Import Terminals[40]



[40] FERC, accessed online April 15, 2009 at http://www.ferc.gov/industries/lng/indus-act/terminals/lng-proposed.pdf Updated as of February 6, 2009

Figure 2.7-2 Potential North American LNG Import Terminals[41]

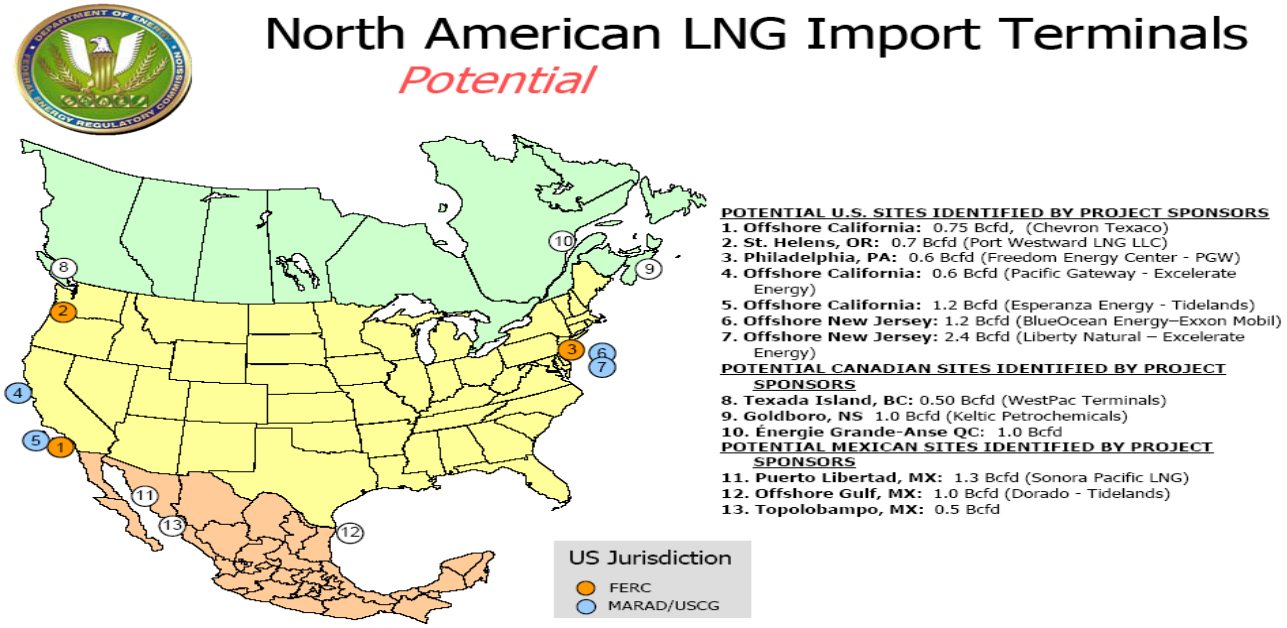


Table 2.7-1: LNG Terminals by Area

Proposed LNG Import Terminals			
Area	Location	Applicant	Capacity
3	Coos Bay, OR	Jordan Cove Energy Project	1.0 Bcfd
2	Astoria, OR	Oregon LNG	1.5 Bcfd
7	California Offshore, Clearwater Port, near Ventura County	Clearwater Port LLC (Northern Star Natural Gas)	1.4 Bcfd
Potential LNG Import Terminals			
2	St. Helens, OR	Port Westward LNG LLC	0.7 Bcfd
3	Offshore CA	Pacific Gateway – Excelerate Energy	0.6 Bcfd
7	Offshore CA, Port Esperanza near Long Beach	Esperanza Energy, LLC	1.2 Bcfd
8	Offshore CA	Chevron Texaco	0.75 Bcfd

[41] FERC, accessed online April 15, 2009 at http://www.ferc.gov/industries/lng/indus-act/terminals/lng-potential.pdf Updated as of February 6, 2009

2.7.3 Impacts of Critical Habitat Designation on Liquefied Natural Gas Projects

Based on available data, this analysis cannot forecast how many projects may or may not ultimately be constructed. Because the LNG projects under consideration in this analysis are still in the preliminary stages, NMFS has yet to make specific recommendations about any project modifications that might be required to mitigate potential adverse impacts on critical habitat for leatherbacks, should it be designated. However, based on previous experience with LNG facilities in the NMFS Southeast Region, project recommendations typically include biological monitoring.[42]

Until specific plans for the LNG projects are made available, their potential impact on leatherback habitat will remain uncertain, as will the nature of any project modifications that might be requested to mitigate adverse impacts. Potential modifications may include biological monitoring and specific measures to prevent or respond to catastrophes. While LNG projects on the West Coast are still in the preliminary stages, NMFS has consulted on several projects on the East Coast, and has not yet required project modifications to mitigate adverse impacts to an aquatic species.[43] Because there is a high level of uncertainty associated with anticipating future management efforts for leatherback critical habitat as a result of LNG projects, this analysis presents only a qualitative discussion.

2.7.4 Summary of Economic Impacts to Liquefied Natural Gas Projects by Area

As discussed above, potential impacts on LNG terminals are subject to high levels of uncertainty for the following reasons:

- The number of future LNG projects likely to reach the construction stage within proposed critical habitat areas is speculative.
- Future management and required project modifications for LNG terminals are uncertain and could vary in scope from project to project.

NMFS was unable to present a quantitative assessment for possible LNG modifications for this analysis. Although the economic analysis for Green Sturgeon included possible modification costs for LNG facilities in overlapping areas, those costs were attributed to potential site limitations or site relocation of facilities which is not applicable to this proposed designation. In is not anticipated that leatherback sea turtle essential features or PCEs will be affected by proposed or potential LNG sighting. The areas most likely to be affected due to potential LNG

[42] Personal communication with K. Baker, NMFS Southeast Region in April 2009.
[43] NMFS (2007), Personal communication with NMFS on July 17, 2008.

modifications are areas 2, 3, 7 and 8. Currently, there is one proposed project and one potential project for areas 2, 3 and 7. There is also one potential project located in area 8. Due to regulations already in place and the likelihood of modifications, it is estimated that incremental costs solely attributed to leatherback critical habitat (excluding resighting costs) would be about 50 percent.

2.8 Economic Impacts of Critical Habitat Designation on Aquaculture

2.8.1 Description of Threat

NMFS has identified aquaculture as a potential threat to areas considered for leatherback critical habitat in three areas: Areas 1, 7 and 8. The threat of aquaculture operations on the safe passage of leatherbacks may be of concern. Net pens, cages, or shellfish rafts and anchored buoys could impede passage in some areas, but these would likely be spatially isolated and temporary. Impacts from the escape of exotic species, introduction of pathogens, and localized increases in fish waste/effluent are more speculative but could result in habitat and food web changes that may affect leatherback prey.

2.8.2 Regulatory Environment & Extent of Activity

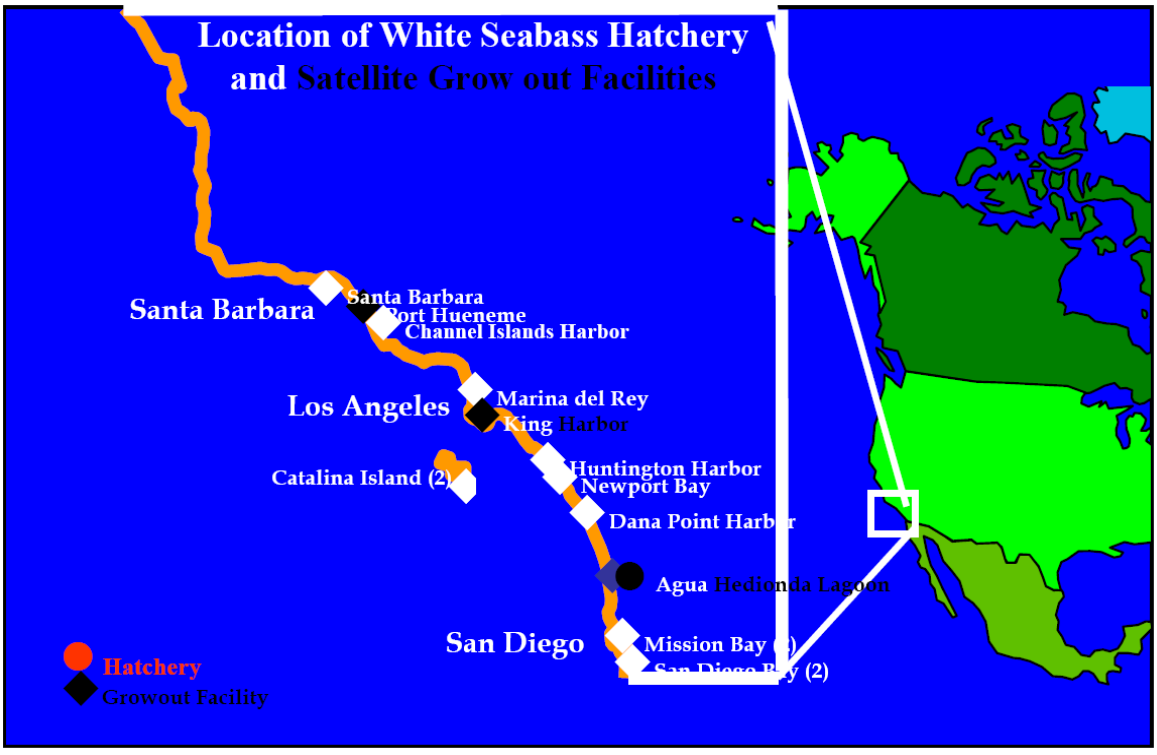
Offshore aquaculture operations may be subject to a variety of Federal and State water quality standards, affording leatherbacks and their habitat a level of baseline protection. In addition, all of the proposed offshore areas are considered to contain essential fish habitat (EFH) for salmon as well as a variety of other fish species. However, NMFS has yet to make specific conservation recommendations related to aquaculture for these areas.

Structures in navigable waters, such as cages or net pens, may require approval from the Coast Guard to ensure they don't adversely affect navigation. The Coast Guard may also require buoys or markers to be maintained over the structures. The applicant may also be required to submit information about the structures to include on nautical charts. An aquaculture facility may require a Section 404 permit from the U.S. Army Corps of Engineers if it involves placing fill in navigable waters, and a Section 10 permit if the proposal involves placing a structure in a navigable waterway. Facilities may require review from the NMFS and U.S. Fish and Wildlife Service for their potential effects on endangered threatened or other sensitive species. They may also require review for effects on EFH, marine mammals, and migratory birds. Other permits may also be required from the EPA (e.g., NPDES permit), Minerals Management Service, and others.

Aquaculture facilities that could affect leatherback PCEs would be located in bays or the open ocean. There are no known aquaculture facilities along the Oregon and Washington coasts[44] and therefore only California waters are considered to affect leatherbacks and their habitat. Three aquaculture facilities were identified in the areas considered for leatherback critical habitat: The Mariculture's longline mussel operation in Santa Barbara (Area 7), the Pacific Abalone Farms located in Monterey Bay (Area 1) and the prospective Hubb's Seaworld operation (Area 8).[45]

Hubbs' white seabass program has expanded and now includes an area from Santa Barbara to San Diego with 13 grow-out locations some of which are onshore in tanks, but with the majority in cages immediately offshore within the coastal zone. All of the cages, with the exception of the one in Santa Barbara which is in open water, are in harbors or embayments (MCRI 2008; see map below from that report)."

Figure 2.8-1 Location of White Seabass Aquaculture Facilities

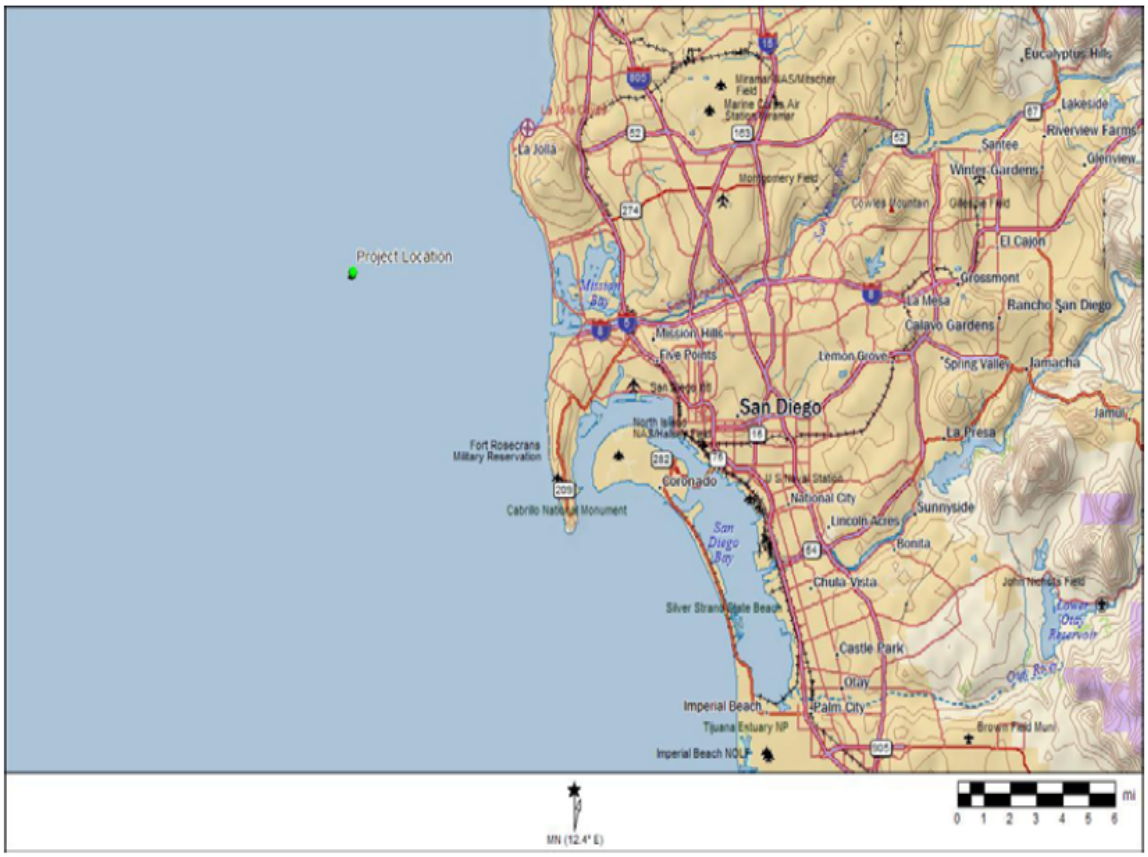


[44] Personal communication with Diane Windham (NMFS) and Michael Rust (NOAA Aquaculture Program), March 2009.

[45] Personal communication with Tom Moore, CA Department of Fish and Game, on June 30, 2009. Also, the Pacific Abalone Farms website accessed at: http://abalone.tv/ on July 2, 2009.

A new proposal is under development: "Researchers from the Hubbs-SeaWorld Research Institute propose building a fish farm as large as 30 football fields just five miles off the coast of Mission Beach. Hubbs-SeaWorld researchers envision farming striped bass, white bass, California halibut and California yellowtail in 24 net pens secured to the sandy ocean bottom about five miles off the Mission Beach coastline."[46] See the map below for the proposed project location.

Figure 2.8-2 Proposed Aquaculture Project Location



2.8.3 Impacts of Critical Habitat Designation on Aquaculture

Leatherback critical habitat, if designated, could impose modifications related to aquaculture, such as:

- Limit the size or location of net pens/farms to avoid particular sites or ensure safe passage within a specific critical habitat area.

[46] SDnews.com 2009; HSWRI 2008

Aquaculture operations may become subject to section 7 consultation under the Clean Water Act, however, it is unknown what if any potential management measures would be recommended in such consultation. In addition, it is unclear the extent to which aquaculture operations may have already adopted management measures independent of the potential designation of critical habitat for leatherbacks. If such measures have been implemented, then impacts on aquaculture operations will be minimal. Given the uncertainty regarding current management and what changes (if any) might be required; this analysis does not quantify impacts on aquaculture operations.

2.8.4 Summary of Economic Impacts to Aquaculture by Area

It is uncertain how and if aquaculture facilities may affect leatherbacks and their critical habitat. The areas that may be affected are coastal areas in California: Areas 1, 7 and 8. The affected PCE is identified as migratory pathway conditions for safe and timely passage and therefore may require aquaculture facilities to limit the size or location of net pens/farms to avoid particular sites or ensure safe and timely passage within a specific critical habitat area. The costs this could entail are unknown, and may be minimal if leatherbacks are able to safely move around the aquaculture facilities.

SECTION 3: SUMMARYOF RESULTS

3.1 Summary of Results

This section presents seven tables that summarize the results of this analysis.

Table 3-1 shows the economic activities, by area, that may require special management to accommodate leatherback critical habitat. The "Y" stands for yes, that activity is present in the respective area.

Table 3-1: Summary of Potential Threats within Areas Considered for Leatherback Critical Habitat Designation

Activity	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6	Area 7	Area 8
NPDES	Y	Y	Y				Y	
Agricultural Pesticides	Y	Y	Y				Y	
Oil Spills	Y	Y	Y	Y	Y	Y	Y	Y
Power Plants	Y						Y	
Desalination Plants	Y						Y	
Tidal/Wave Energy Projects	Y		Y				Y	
LNG		Y	Y				Y	Y
Aquaculture	Y						Y	Y

Table 3-2 presents the level of economic activity by area and by threat. The metric used to estimate the level of activity varies by threat. For example, an approximate number of facilities currently in place is used to estimate the number or power plants, while the potential number of projects is used to estimate the number of LNG facilities.

Table 3-2: Activities Count

Area	NPDES: Minor	NPDES: Major	Agricultural Pesticides	Oil Spills	Power Plants	Desalination	Tidal/Wave Energy	LNG	Aquaculture
	# of facilities (<5 miles from coast)	# of facilities (<5 miles from coast)	acres of farmland (<5miles from coast)	# gallons	# of plants	# of plants	# of projects	# of facilities	# of farms
1	0	10	4,285	20,000	1	17	4		1
2	0	33	18,763	20,000				2	
3	1	10	10,304	20,000			7	2	
4				20,000					
5				20,000					
6				20,000					
7	0	29	8,207	20,000	6	15	1	2	1
8				20,000				1	1

Table 3-3 presents the estimated annualized cost by activity. The "Cost Range" column presents a per project cost estimate that has not been discounted. That per project cost is assumed to be spread evenly over the number of years listed in the "Timeframe" column, and then a present value and annualized value are calculated. For some activities, because the flow of impacts is assumed to be equal across years, the annualized cost is equal to the annual cost (the total divided by the number of years). In order to calculate oil spill costs, it was assumed that one 20,000 gallon spill occurred in each area and therefore there is not an associated timeframe because this analysis did not attempt to predict the probability nor the frequency of oil spills occurring in each area. However, when summing all activity costs by area, the total 20,000 gallon oil spill cost was used.

Table 3-3: Annualized Costs by Activity

Activity	Cost Category	Cost Range	Present Value	Timeframe (years)	Metric	2009 Annualized Costs (Discounted at 7%)
NPDES: Minor facilities	Low	$0	$0	20	per plant	$0
	Midpoint	$148,000	$78,400			$7,400
	High	$296,000	$156,800			$14,800
NPDES: Major Facilities	Low	$957,000	$506,900	20	per plant	$47,850
	Midpoint	$1,280,000	$678,000			$64,000
	High	$1,603,200	$849,200			$80,160
Agricultural Pesticides	Low: <1	Varies by area depending on cropland value			Acres	$118,000-$1,500,000
	Midpoint: <1					$294,000-$3,760,000
	High: <1					$471,000-$6,000,000
	Low: <5					$660,000-$4,900,000
	Midpoint: <5					$1,640,000-$12,300,000
	High: <5					$2,600,000-$19,700,000
Oil Spills	Low: In-shore	Varies by a number of factors described in Section 2.3.3			per spill	$1,120,000
	High: In-shore					$1,940,000
	Low: Off-shore					$60,000
	High: Off-shore					$140,000
Power Plants	Low	$957,000	$506,900	20	per plant	$47,850
	Midpoint	$1,280,000	$678,000			$64,000
	High	$1,603,200	$849,200			$80,160
Desalination	Low: Area 1	$0	$0	20	per unit based on plant capacity	$0
	High: Area 1	$31,053,000	$16,448,300			$1,552,600
	Low: Area 7	$0	$0			$0
	High: Area 7	$16,761,200	$8,877,800			$838,000
Tidal/Wave Energy	N/A	$2,029,000	716,200	30	per project	$67,600

Table 3-4 presents the incremental score by area and by activity. The incremental score is used to develop an estimate of the share of impacts that may be attributed to leatherback critical habitat. The scores vary both by activity and by area depending on the level of baseline protection provided by Federal, State and local regulations as well as the presence of other listed species, other listed critical habitat, etc. The incremental scores range from 0.3 for activities that exist in areas with a large amount of current protections, such as marine sanctuary areas and areas with critical habitat designations for other species to 0.5 for activities that have moderate protection, such as protection of listed leatherbacks and EPA regulations.

Table 3-4: Incremental Scores

Area	NPDES: Minor	NPDES: Major	Agricultural Pesticides	Oil Spills	Power Plants	Desalination	Tidal/Wave Energy	LNG	Aquaculture
1	0.5	0.5	0.5	0.3	0.3	0.3	0.5	-	-
2	0.3	0.3	0.3	0.3	-	-	-	0.5	-
3	0.5	0.5	0.5	0.3	-	-	0.5	0.5	-
4	-	-	-	0.5	-	-	-	-	-
5	-	-	-	0.5	-	-	-	-	-
6	-	-	-	0.5	-	-	-	-	-
7	0.5	0.5	0.5	0.4	0.3	0.5	0.5	0.5	0.5
8	-	-	-	0.5	-	-	-	0.5	0.5

Table 3-5a presents total estimated impacts (costs) by area and by activity for both the low and high scenarios for the 6 activity types where a quantitative assessment was possible.

Table 3-5a: Total Impacts (Activities with Quantitative Costs)

		Area	1	2	3	4	5	6	7	8
NPDES: Minor	<1 mile	Low	$0	$0	$0	-	-	-	$0	-
		High	$0	$0	$7,400	-	-	-	$0	-
	<5 miles	Low	$0	$0	$0	-	-	-	$0	-
		High	$0	$0	$7,400	-	-	-	$0	-
NPDES: Major	<1 mile	Low	$215,300	$157,900	$143,600	-	-	-	$574,200	-
		High	$360,700	$264,500	$240,500	-	-	-	$961,900	-
	<5 miles	Low	$239,300	$473,700	$239,300	-	-	-	$693,800	-
		High	$400,800	$793,600	$400,800	-	-	-	$1,162,300	-
Agricultural Pesticides	<1 mile	Low	$308,100	$35,300	$167,600	-	-	-	$751,700	-
		High	$1,232,300	$141,300	$670,400	-	-	-	$3,006,600	-
	<5 miles	Low	$1,178,400	$197,000	$901,600	-	-	-	$2,462,000	-
		High	$4,713,500	$788,000	$3,606,500	-	-	-	$9,848,200	-
Oil Spills	Low		$336,900	$336,900	$336,900	$25,100	$25,100	$25,100	$234,600	$25,100
	High		$580,200	$580,200	$580,200	$68,200	$68,200	$68,200	$414,100	$68,200
Power Plants	Low		$14,400	-	-	-	-	-	$86,100	-
	High		$24,000	-	-	-	-	-	$144,300	-
Desalination	Low		$0	-	-	-	-	-	$0	-
	High		$435,300	-	-	-	-	-	$391,600	-
Tidal/Wave Energy	Low		$0	-	$0	-	-	-	$0	-
	High		$135,200	-	$236,600	-	-	-	$33,800	-

Table 3-5b provides a summary of possible impacts and costs for the two activities, LNG projects and aquaculture facilities, in which only a qualitative assessment was possible. "Impacts" refers to the types of modifications that those activities may have to implement due to leatherback critical habitat and the cost range was determined from the incremental scores. Therefore, because the possible modifications for LNG projects are extremely speculative and no projects are currently in place on the West Coast, the impacts that may occur in the future were given a medium rating. If a modification does occur to future LNG projects because of leatherback critical habitat, it is expected that about 50 percent (medium costs) would be attributed solely to the leatherback critical habitat. This is because of regulations already in place for LNG projects and in those particular areas. For aquaculture, it is expected that these facilities may have small, minor modifications due to leatherback critical habitat in the future (low impacts) and it was deemed that aquaculture facilities and the areas shown below already have a moderate amount of regulations in place and hence, if a modification took place, the costs attributed solely to leatherback critical habitat would be medium.

Table 3-5b: Total Impacts (Activities with Qualitative Discussion)

Area	LNG	Aquaculture
1		Low impacts with medium costs
2		
3	Medium impacts with medium costs	
4		
5		
6		
7	Medium impacts with medium costs	Low impacts with medium costs
8	Medium impacts with medium costs	Low impacts with medium costs

Table 3-6 presents total impacts summarized by area under the low, mid, and high scenarios. Under the low cost scenario, the one mile buffer was used for NPDES facilities and agricultural pesticide application activities. In this scenario, Area 7 has the highest annual impacts at about $1.65 million, while Areas 1 and 3 have the next highest annualized impacts at about $875 thousand and $648 thousand, respectively. Under the high cost scenario, the 5 mile buffer was used for NPDES facilities and agricultural pesticide application activities. In this scenario, yet again, Area 7 has the highest annual impacts at almost $12 million, while Areas 1, 3 and 2 have the next highest annualized impacts at $6.3 million, $4.8 million and $2.2 million, respectively.

Under each scenario, areas 8, 4, 5 and 6 have identical costs, since the only quantitative cost calculated for these areas was the possibility of an oil spill. Area 8 would be expected to have a higher cost than areas 4, 5, and 6 since LNG projects and aquaculture facilities were identified as potentially existing in area 8.

Table 3-6: Ranked Impacts

Area	Annualized Impacts (7% Discount Rate)			Activities with only a qualitative analysis
	Low*	Mid	High**	
7	$1,646,600	$6,820,450	$11,994,300	LNG and Aquaculture
1	$874,700	$3,581,850	$6,289,000	
3	$648,100	$2,739,800	$4,831,500	LNG
2	$530,100	$1,345,950	$2,161,800	LNG
8	$25,100	$46,650	$68,200	LNG and Aquaculture
4	$25,100	$46,650	$68,200	
5	$25,100	$46,650	$68,200	
6	$25,100	$46,650	$68,200	
Total	$3,799,900	$14,674,650	$25,549,400	LNG and Aquaculture

*Where applicable, <1 mile buffer used
**Where applicable, <5 mile buffer used

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APPENDIX A: NON-COST SUMMARY INFORMATION

Appendix A provides a table showing non-cost summary information for the 8 activities identified in the report. The information provided is: the areas the activity is located in, the PCE the activity could affect and the nature of that threat, the Section 7 nexus for that activity and the possible modifications that activity may have to implement due to leatherback critical habitat.

Table A-1: Summary of Activities: Threat, Section 7 Nexus & Possible Modifications

Activity	Areas	PCE and Nature of the threat	Section 7 nexus	Possible change to activity
NPDES	1,2,3,7, 8	Prey PCE - may cause contamination of all stages of jellyfish, including bioaccumulation of toxins through small prey ingestion. Limited studies have shown that jellyfish may concentrate higher levels of metals (e.g. Cadmium) proportionately than fish, and given the likely low energetic value of jellyfish and the fact that leatherbacks therefore must consume large quantities to meet their needs, imply that they may be exposed to high levels of metals, particularly in coastal areas (Caurant et al. 1999). However the effects of these levels on jellyfish or leatherbacks are unknown. Aquaculture facilities will also need NPDES permits, so impacts on prey from aquaculture would be addressed here. Use of aquatic pesticides also requires NPDES permits. Impact on quantity of prey unknown.	Issuance of CWA permits. State water quality standards are subject to a section 7 consultation between NOAA and the EPA and NOAA can review individual NPDES permit applications for impacts on listed species.	Where federal permits are necessary, ensure discharge meets other federal standards and regulations (EPA, CWA). Require measures to prevent or respond to a catastrophic event (i.e. using best technology to avoid unnecessary discharges.
Agriculture Pesticide Application	1,2,3,7	Prey PCE - Pesticide application is believed to affect water quality , and prey resources available within proposed critical habitat areas. Agriculture and development increase nitrate loads, which are associated with eutrophication and increased scyphomedusae blooms (Purcel et al. 2007). Blooms can disrupt the natural abundance,	EPA consultation on FIFRA, pesticide registration program, and NPDES permits for aquatic pesticides	Economic analysis refers to restriction on application of some pesticides within certain distances of "salmon supporting waters" and listed measures (e.g., limited of vegetation removal near streams). Assumed that similar

		distribution, and availability of the primary food that leatherbacks forage on. It is difficult to characterize this threat since the effects of pesticides on jellyfish and rate of diffusion within marine waters is unknown.	(see National Cotton Council vs. EPA). Also with USFS and BLM.	methods would be required of farmlands within 1 and 5 miles of critical habitat areas and assigned a range of costs based upon total acreage within buffer zones.
Oil spill	1,2,3,4, 5,6,7,8	Prey PCE – spills or clean up may kill or compromise condition of prey (use of chemical dispersants, *in situ* burning). Passage PCE – Oil spills may affect migratory pathway conditions, including impedance of movement and physical disturbance (e.g. booming, *in situ* burning, oil on surface).	Review of oil spill response plan from USCG. Regulations under the Water Pollution Control Act	Conduct surveys and possibly restrict or limit use of boom, dispersants, and in-situ burning in areas where leatherbacks are found to be present. Use existing guidance on oil spill response, but may be more likely to respond to a spill offshore if it is designated critical habitat.
Power plants	1, 7	Prey PCE – discharge of warm water may affect health of jellyfish prey, although evidence that this may cause jellyfish blooms. The effects of entrainment on prey resources are likely very localized and affect a small proportion of the coastal population of jellies. Purcell et al. (2007) report that structures associated with coastal power plants may serve as substrate for the polyp stage of jellyfish.	License through the Nuclear Regulatory Commission	Require cooling of thermal effluent before release to the environment (may require use of different technology) and treatment of any contaminated waste materials.
Desalination plants	1,7	Prey PCE - Impingement or entrainment of jellyfish could result in localized and temporary detrimental impacts on the prey PCE. Also, the discharge of hypersaline water could affect jellyfish; however, this is speculative and may have both beneficial and detrimental impacts.	A desalination facility may require a Section 404 permit from the U.S. Army Corps of Engineers if it involves placing fill in navigable waters, and a Section 10 permit if the proposal involves placing a	Potential conservation efforts to mitigate desalination impacts may include the treatment of hypersaline effluent to ensure that salinity levels are restored to normal values. The costs of treating hypersaline effluent or finding an alternate manner of brine disposal can vary widely across plants depending on plant capacity and design.

			structure in a navigable waterway.	
Tidal/wave energy facilities	1,3,7	Prey PCE – possible disturbance to prey species during their benthic, polyp stage (although the location of the polyp fields are unknown). Passage PCE – possible obstruction of passage or migration due to structure. It is unknown whether the passage PCE could also be affected by the electromagnetic fields (EMF) generated by these types of projects. EMFs have been shown to impact nervous system function in many species and could potentially impact the ability of leatherbacks to orient and navigate. However, these effects are likely to attenuate quickly with distance away from the source of the electromagnetic field.	Tidal and wave energy projects are subject to FERC permitting and licensing requirements. Section 401 of the Clean Water Act	Based on NMFS consultations on several pilot projects, project modifications could include installation of covers on turbines, installation of sampling gear, and biological monitoring. Should EMF impacts be found, armoring and trenching of cables and shielding of infrastructure may be required; however, these measures are not certain to be effective and are unlikely to be required in most situations. Potential modifications to these projects to mitigate adverse impacts may include spatial or temporal restrictions on project installation, operation, and maintenance.
LNG facilities	3,7,8	Passage PCE - the construction and operation of LNG terminals. Prey PCE - cold water discharge, leaks and spills, release of anti-fouling chemicals into the water, disturbance of benthic habitat and noise could impact prey. Dredging and filling associated with construction and maintenance (to allow tanker passage) could have impacts on benthic habitat and possibly the early life stages of leatherback prey resources, although the location of polyp fields is not known.	Clean Water Act permits under section 401 (water quality certificate) and/or section 404 (a dredge and fill permit) and Clean Air Act permits under section 502 may be required	Potential modifications may include biological monitoring, spatial restrictions on project installation, and specific measures to prevent or respond to catastrophes. While LNG projects on the West Coast are still in the preliminary stages, NMFS has consulted on several projects on the East Coast, and has not yet required project modifications to mitigate adverse impacts to an aquatic species habitat.
Aquaculture	1, 7,8	Passage PCE - The threat of aquaculture on	An aquaculture	Limit the size or location of net

		leatherbacks is safe passage concerns. Net pens, cages, or shellfish rafts and anchored buoys could impede passage in some areas, but these would likely be spatially isolated and temporary. Prey PCE – potential effects on prey PCE are addressed within the NPDES effects since aquaculture facilities require permits to manage discharge into the water.	facility may require a Section 404 permit from the U.S. Army Corps of Engineers if it involves placing fill in navigable waters, and a Section 10 permit if the proposal involves placing a structure in a navigable waterway. Requires an NPDES permit (see NPDES activity above).	pens/farms to avoid particular sites or ensure safe passage within a specific critical habitat area. However, it is not known what if any potential management measures would be recommended in a section 7 consultation.

APPENDIX B: LAWS AND REGULATIONS THAT MAY PROVIDE BASELINE PROTECTION FOR LEATHERBACK SEA TURTLES

Clean Water Act (33 U.S.C. 1251 ET SEQ. 1987)
The Clean Water Act (CWA) establishes the basic structure for regulating discharges of pollutants into the waters of the United States. It gives the Environmental Protection Agency (EPA) the authority to implement pollution control programs such as setting wastewater standards for industry. The CWA also continued requirements to set water quality standards for all contaminants in surface waters.

Pursuant to Section 404 of the CWA, it is unlawful for any person to dredge, dispose off dredge material, or discharge a pollutant from a point source into navigable waters, unless a permit is obtained from the U.S. Army Corps of Engineers (USACE). As part of pollution prevention activities, the USACE may limit activities in waterways through the Section 404 permitting process, independent of leatherback concerns. These reductions in pollution may benefit leatherback critical habitat.

Pursuant to Section 402 of the CWA and under the National Pollutant Discharge Elimination System (NPDES) program, EPA sets pollutant-specific limits on the point source discharges for major industries and provides permits to individual point sources that apply to these limits. Under the water quality standards program, EPA, in collaboration with States, establishes water quality criteria to regulate ambient concentrations of pollutants in surface waters.

Under section 401 of the CWA, all applicants for a Federal license or permit to conduct activity that may result in discharge to navigable waters are required to submit a State certification to the licensing or permitting agency. For example, the 1995 Bay-Delta Water Quality Control Plan and Water Right Decision 1641 incorporates objectives such as providing water for fish and wildlife, including anadromous fish. Costs associated with this and other existing water control plans are considered baseline protection in this analysis.

Magnuson-Stevens Fishery Conservation and Management Reauthorization Act 2006
This law signed by the President in January, 2007, amends the older Magnuson-Stevens Fishery Conservation and Management Act (as amended through 1996) that included bycatch reduction standards, and provision for the description of essential fish habitat in fishery management plans and consideration of actions to ensure the conservation and enhancement of habitat. The newer Magnuson-Stevens Reauthorization Act mandates the use of annual catch limits and accountability measures to end overfishing, provides for widespread market-based fishery management through limited access programs, and calls for increased international cooperation. This act may provide protection to leatherbacks by imposition of stringent bycatch measures.

Marine Mammal Protection Act of 1972 as Amended 2007
The Marine Mammal Protection Act (MMPA) was enacted in response to increasing concerns among scientists and the public that significant declines in some species of marine mammals were caused by human activities. The MMPA established a moratorium on the taking of marine mammals in U.S. waters. Exceptions can only be made through permits/regulations for take incidental to commercial fishing, nonfishing activities (e.g., military exercises), scientific research, and public display. The MMPA may provide protection to migratory conditions to allow for safe and timely passage of leatherbacks.

Marine Protection, Research, and Sanctuaries Act of 1972
This Act authorizes the Secretary of Commerce to designate and manage areas of the marine environment with special national significance due to their conservation, recreational, ecological, historical, scientific, cultural, archeological, educational, or esthetic qualities as national marine sanctuaries. The Act also directs the Secretary to facilitate all public and private uses of those resources that are compatible with the primary objective of resource protection. Five sanctuaries have been designated within the proposed leatherback critical habitat area: In California—Channel Islands, Cordell Bank, Gulf of Farallones, Monterey Bay; in Washington—Olympic Coast.

Federal Power Act (16 U.S.C. § 800 1920, as amended)
The Federal Power Act (FPA) was promulgated to establish the Federal Energy Regulatory Commission (FERC) to oversee non-Federal hydropower generation. The FERC is an independent Federal agency governing approximately 2,500 licenses for non- Federal hydropower facilities, has responsibility for national energy regulatory issues. This Act may provide protection to leatherback habitat from hydropower activities. Section 10(j) of the Federal Power Act (FPA) was promulgated to ensure that FERC considers both power and non-power resources during the licensing process. More specifically, section 18 of the FPA states that FERC shall require the construction, operation, and maintenance by a licensee at its own expense of a fishway if prescribed by the Secretaries of Interior (delegated to the Fish and Wildlife Service) and Commerce (NOAA).

Fish and Wildlife Coordination Act (16 U.S.C.§§ 661-666 1934, as amended)
This law provides that, whenever the waters or channels of a body of water are modified by a department or agency of the U.S. government, the department or agency must first consult with the U.S. Fish and Wildlife Service and with the head of the agency exercising administration over the wildlife resources of the State where modification will occur with a view to the conservation of wildlife resources.
The purpose of this Act is to ensure that fish and wildlife resources are equally considered with other resources during the planning of water resources development projects by authorizing FWS to provide assistance to Federal and State agencies in protecting game species and studying the effects of pollution on wildlife. This Act may offer protection to leatherback habitat by requiring consultation concerning the species with FWS for all instream activities with a Federal nexus.

Rivers and Harbors Act (33 USC §§ 401 ET SEQ. 1938)
The Rivers and Harbors Act (RHA) places Federal improvements of rivers, harbors and other waterways under the jurisdiction of the Department of the Army, USACE and requires that all improvements include due regard for wildlife conservation. This Act may provide protection to the leatherback critical habitat related to activities in bays and estuarine navigable waters. Under sections 9 and 10 of the RHA, the USACE is authorized to regulate the construction of any structure or work within navigable waterways. This includes, for example, bridges and docks.

National Environmental Policy Act (42 USC §§ 4321-4345 1969)
The National Environmental Policy Act (NEPA) requires that all Federal agencies conduct a detailed environmental impact statement (EIS) in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment. The NEPA process may provide protection to the leatherback critical habitat for activities that have Federal involvement, if alternatives are considered and selected that are less harmful to leatherback critical habitat than other alternatives.

The Sikes Improvements Act (16 USC §670 1997)
The Sikes Improvement Act (SIA) requires military installations to prepare and implement an Integrated Natural Resources Management Plan (INRMP). The purpose of the INRMP is to provide for:

- The conservation and rehabilitation of natural resources on military installations;
- The sustainable multipurpose use of the resources, which shall include hunting, fishing, trapping, and nonconsumptive uses; and
- Subject to safety requirements and military security, public access to military installations to facilitate the use of the resources.

INRMPs developed in accordance with SIA may provide protection to leatherback critical habitat within military training ranges.

California Environmental Quality Act (CEQA) (California Natural Resources Code §15065(A))
CEQA is a California State statute that requires State and local agencies (known as "lead agencies") to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible. Projects carried out by Federal agencies are not subject to CEQA provisions. CEQA instructs the lead agency (typically a county or city community development or planning department in the case of land development projects) to examine impacts from a broad perspective, taking into account the value of species' habitats that may be impacted by the project in an Environmental Impact Report (EIR). The lead agency must determine which, if any, project impacts are potentially significant and, for any such impacts identified, whether feasible mitigation measures or feasible alternatives will reduce the impacts to a level less than significant. It is within the power of a lead agency to decide that negative impacts are acceptable in light of economic, social, or other benefits generated by the project.

Long-term Management Strategy (LTMS) for the Placement of Dredged Material in the San Francisco Bay Region
The LTMS is a multi-agency effort on the part of the USACE, EPA, NOAA and others to eliminate unnecessary dredging and maintain in an economically and environmentally sound manner those channels necessary for navigation in San Francisco Bay and Estuary. The LTMS also establishes dredging windows for salmon and other aquatic species. These seasonal limitations on dredging are intended to accommodate salmon spawning, which may have ancillary benefits for leatherback critical habitat.

The Comprehensive Conservation and Management Plan for the San Francisco Bay-delta Estuary
The Comprehensive Conservation and Management Plan for the San Francisco Bay-Delta Estuary helps to restore and maintain the estuary's water quality and natural resources. This plan is jointly sponsored by the EPA and the State of California, and is considered to be a blueprint for restoring and maintaining the chemical, physical, and biological integrity of the Bay and Delta. Many of the recommended actions may improve leatherback prey distribution, diversity, and abundance by improving water quality.

Keene-Nielsen Fisheries Restoration Act of 1985
This Act states that California intends to make reasonable efforts to prevent further declines in fish and wildlife, restore fish and wildlife to historic levels where possible, and enhance fish and wildlife resources where possible. Just over $15 million were initially authorized in approved legislation; however, only $11.3 million were actually appropriated between 1985 and 1987. The Act was reworded through 1990 legislation to closely tie expenditures from this account to projects called for under the Salmon, Steelhead Trout, and Anadromous Fisheries Program Act of 1988. However, the legislation provided no funding to the Keene-Nielsen account, nor have the budgets of subsequent governors.

Other Statues and Regulations that Apply to Land Use Activities
While the following statutes and regulations may apply to lands and waters that fall within leatherback habitat areas, they are unlikely to provide significant baseline protections and are not considered in the analysis.
• *North American Wetland Conservation Act (16 USC § 4401 et seq. 1989)* - NAWCA encourages partnerships among public agencies and other interests to protect, enhance, restore and manage an appropriate distribution and diversity of wetland ecosystems and other habitats for migratory birds and other fish and wildlife.

• *Executive Order 11988 and 11990 (1977)* – These Executive Orders require, to the extent possible, prevention of long and short term adverse impacts associated with the occupancy and modification of floodplains and prevention of direct or indirect support of floodplain development wherever there is a practicable alternative.

• *Coastal Zone Management Act (16 USC §§ 1451 et seq. 1972)* – CZMA establishes an extensive Federal grant program to encourage coastal States to develop and implement coastal zone management programs to provide for protection of natural resources, including wetlands, flood plains, estuaries, beaches, dunes, barrier islands, coral reefs, and fish and wildlife and their habitat.

• *California Endangered Species Act (California Fish and Game Code §§ 2050, et seq.)* - The CESA parallels the main provisions of the Federal Endangered Species Act and is administered by the California Department of Fish and Game (DFG). CESA prohibits the "taking" (the California Fish and Game Code defines "take" as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill") of listed species except as otherwise provided in State law. The CESA also applies the take prohibitions to species petitioned for listing ("candidate species").

APPENDIX C: SENSITIVITY ANALYSIS

Section 2 of this analysis presents estimated annualized impacts by area and economic activity. These estimated impacts assume that a certain baseline level of protection is afforded leatherbacks from existing state, Federal and local regulations, as well as the presence of other listed marine species, other listed critical habitat, etc. However, a degree of uncertainty exists regarding this level of baseline protection and future actions likely to be undertaken specifically for the benefit of the leatherbacks and their habitat.

Because of this level of uncertainty, this appendix presents impacts without applying the "incremental scores," in order to inform decision-makers about the range of potential impacts. Table C-1 presents total un-scaled impacts by area, as well as the difference between these impacts and those estimated in previous chapters, which applied incremental scores. The ranking of total area impacts does not change for the midpoint or high scenarios, when comparing costs that incorporate incremental scores compared to costs without incremental scores. Under the low scenario, there is one change in the ranking order. When incremental scores are applied, area 3 has higher costs than area 2; however, when no incremental scores are used, area 2 has higher costs than area 3. This is mainly due to the fact that area 3 has wave/tidal energy project costs under the high scenario, but not under the low scenario and area 2 does not have this activity. Also, in general, area 3 has higher incremental scores than area 2, so when taking away the incremental scores, the costs for area 3 would decrease more than area 2.

Table C-1: Summary of Annualized Impacts by Area (Discounted at 7 percent)

Area	No Incremental Scores			With Incremental Scores			Difference		
	Low*	Mid	High**	Low*	Mid	High**	Low*	Mid	High**
1	$2,217,500	$8,090,950	$13,964,400	$874,700	$3,581,850	$6,289,000	$1,342,800	$4,509,100	$7,675,400
2	$1,766,800	$4,486,500	$7,206,200	$530,100	$1,345,950	$2,161,800	$1,236,700	$3,140,550	$5,044,400
3	$1,745,100	$5,972,600	$10,200,100	$648,100	$2,739,800	$4,831,500	$1,097,000	$3,232,800	$5,368,600
4	$50,300	$93,300	$136,300	$25,100	$46,650	$68,200	$25,200	$46,650	$68,100
5	$50,300	$93,300	$136,300	$25,100	$46,650	$68,200	$25,200	$46,650	$68,100
6	$50,300	$93,300	$136,300	$25,100	$46,650	$68,200	$25,200	$46,650	$68,100
7	$3,525,400	$13,939,850	$24,354,300	$1,646,600	$6,820,450	$11,994,300	$1,878,800	$7,119,400	$12,360,000
8	$50,300	$93,300	$136,300	$25,100	$46,650	$68,200	$25,200	$46,650	$68,100

*where applicable, < 5 miles used

**where applicable, < 1 mile buffer use

Table C-2: Summary of Economic Impacts to NPDES Facilities by Area

Area	Buffer Zone	Total Annualized Costs (Discounted at 7%)					
		Minor			Major		
		Low	Mid	High	Low	Mid	High
1	<1	$0	$0	$0	$430,700	$576,050	$721,400
	<5	$0	$0	$0	$478,500	$640,050	$801,600
2	<1	$0	$0	$0	$526,300	$704,050	$881,800
	<5	$0	$0	$0	$1,579,000	$2,112,150	$2,645,300
3	<1	$0	$7,400	$14,800	$287,100	$384,050	$481,000
	<5	$0	$7,400	$14,800	$478,500	$640,050	$801,600
7	<1	$0	$0	$0	$1,148,400	$1,536,100	$1,923,800
	<5	$0	$0	$0	$1,387,600	$1,856,100	$2,324,600

Table C-3: Summary of Economic Impacts to Agricultural Pesticide Application by Area

Area	Buffer Zones	Total Annualized Impacts (Discounted at 7%)		
		Low	Mid	High
1	<1	$616,200	$1,540,450	$2,464,700
	<5	$2,356,700	$5,891,850	$9,427,000
2	<1	$117,700	$294,350	$471,000
	<5	$656,700	$1,641,750	$2,626,800
3	<1	$335,200	$838,000	$1,340,800
	<5	$1,803,300	$4,508,150	$7,213,000
7	<1	$1,503,300	$3,758,250	$6,013,200
	<5	$4,924,100	$12,310,250	$19,696,400

Table C-4: Summary of Economic Impacts of Oil Spills by Area

Area	Total Annualized Impacts (Discounted at 7 %)		
	Low	Mid	High
1	$1,122,800	$1,528,450	$1,934,100
2	$1,122,800	$1,528,450	$1,934,100
3	$1,122,800	$1,528,450	$1,934,100
4	$50,300	$93,300	$136,300
5	$50,300	$93,300	$136,300
6	$50,300	$93,300	$136,300
7	$586,600	$810,900	$1,035,200
8	$50,300	$93,300	$136,300

Table C-5: Summary of Economic Impacts to Power Plants by Area

Area	Total Annualized Impacts (Discounted at 7 %)		
	Low	Mid	High
1	$47,800	$64,000	$80,200
7	$287,100	$384,050	$481,000

Table C-6: Summary of Economic Impacts of Desalination Projects by Area

Area	Total Annualized Costs (Discounted at 7 %)		
	Low	Mid	High
1	$0	$725,550	$1,451,100
7	$0	$391,650	$783,300

Table C-7: Summary of Economic Impacts to Tidal/Wave Energy Projects by Area

Area	Total Annualized Costs (Discounted at 7%)
1	$270,400
3	$473,200
7	$67,600

APPENDIX D: 3 PERCENT DISCOUNT RATE EXHIBITS

Appendix D provides detailed tables for impacts discussed in Sections 2 of this economic analysis. Present values and annualized costs are estimated based on a discount rate of three percent, as opposed to 7 percent, which is used in Section 2.

For most activities, estimated impacts are based on an assumed annual cost applied evenly across all relevant years. Because impacts are based on an evenly distributed annual cost, annualized impacts for these activities are not affected by the discount rate selected. Impacts to NPDES-permitted activities and power plants incorporate certain assumptions about the timing of capital costs and operation and maintenance activities; therefore, impacts to these activities do change based on the discount rate.

Table D-1 shows the total cost estimates, by area, using a three percent discount rate. Tables D-2 and D-3 show costs for NPDES facilities and power plants, respectively, since these are the only activities where a change in discount rate will change the cost estimates.

Table D-1: Summary of Annualized Impacts by Area (Discounted at 3 percent)

Area	Annualized Impacts (Discounted at 3%)			Activities with only a qualitative analysis
	Low	Mid	High	
1	$818,800	$3,517,450	$6,216,100	
2	$491,700	$1,258,650	$2,025,600	LNG
3	$613,100	$2,687,750	$4,762,400	LNG
4	$25,100	$46,650	$68,200	
5	$25,100	$46,650	$68,200	
6	$25,100	$46,650	$68,200	
7	$1,485,900	$6,627,950	$11,770,000	LNG and Aquaculture
8	$25,100	$46,650	$68,200	LNG and Aquaculture

Table D-2: Summary of Economic Impacts to NPDES Facilities by Area (Discounted at 3 percent)

Area	Buffer Zone	Total Annualized Costs (Discounted at 3%)					
		Minor			Major		
		Low	Mid	High	Low	Mid	High
1	<1	$0	$0	$0	$162,900	$230,850	$298,800
	<5	$0	$0	$0	$181,000	$256,500	$332,000
2	<1	$0	$0	$0	$119,500	$169,300	$219,100
	<5	$0	$0	$0	$358,400	$507,900	$657,400
3	<1	$0	$3,600	$7,100	$108,600	$153,900	$199,200
	<5	$0	$3,600	$7,100	$181,000	$256,500	$332,000
7	<1	$0	$0	$0	$434,400	$615,600	$796,800
	<5	$0	$0	$0	$524,900	$743,850	$962,800

Table D-3: Summary of Economic Impacts to Power Plants by Area (Discounted at 3 percent)

Area	Activity Count (Estimated # of power plants)	Total Annualized Impacts (Discounted at 3%)		
		Low	Mid	High
1	1	$10,900	$15,400	$19,900
7	6	$65,200	$92,350	$119,500

APPENDIX E: INITIAL REGULATORY FLEXABILITY ANALYSIS

This analysis considers the extent to which the potential economic impacts associated with the designation of critical habitat for the leatherback sea turtle could be borne by small businesses. The analysis presented is conducted pursuant to the Regulatory Flexibility Act (RFA) as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996. Information for this analysis was gathered from the Small Business Administration (SBA) and U.S. Census Bureau.

Introduction

First enacted in 1980, the RFA was designed to ensure that the government considers the potential for its regulations to unduly inhibit the ability of small entities to compete. The goals of the RFA include increasing the government's awareness of the impact of regulations on small entities and to encourage agencies to exercise flexibility to provide regulatory relief to small entities.

When a Federal agency proposes regulations, the RFA requires the agency to prepare and make available for public comment an analysis that describes the effect of the rule on small entities (i.e., small businesses, small organizations, and small government jurisdictions). For this rulemaking, this analysis takes the form of an initial regulatory flexibility analysis (IRFA). Under 5 U.S.C., Section 603(b) of the RFA, an IRFA is required to contain:

i. A description of the reasons why action by the agency is being considered;
ii. A succinct statement of the objectives of, and legal basis for, the proposed rule;
iii. A description of and, where feasible, an estimate of the number of small entities to which the proposed rule will apply;
iv. A description of the projected reporting, recordkeeping and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for preparation of the report or record;
v. An identification, to the extent practicable, of all relevant Federal rules which may duplicate, overlap or conflict with the proposed rule;
vi. Each initial regulatory flexibility analysis shall also contain a description of any significant alternatives to the proposed rule which accomplish the stated objectives of applicable statutes and which minimize any significant economic impact of the proposed rule on small entities.

Needs and Objective of the Rule

The leatherback sea turtle was listed as endangered throughout its range under the Endangered Species Act (ESA) on June 2, 1970 (35 FR 8491). Section 4(b)(2) of the ESA requires NOAA to designate critical habitat for threatened and endangered species "on the basis of the best scientific data available and after taking into consideration the economic impact, impact on national security, and any other relevant impact, of specifying any particular area as critical habitat." The ESA defines critical habitat under Section 3(5)(A) as:

> "(i) the specific areas within the geographical area occupied by the species, at the time it is listed…, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by the species at the time it is listed…upon a determination by the Secretary that such areas are essential for the conservation of the species."

DESCRIPTION AND ESTIMATE OF THE NUMBER OF SMALL ENTITIES TO WHICH THE RULE APPLIES

Definition of a Small Entity

Three types of small entities are defined in the RFA:

i. **Small Business.** Section 601(3) of the RFA defines a small business as having the same meaning as small business concern under section 3 of the Small Business Act. This includes any firm that is independently owned and operated and is not dominant in its field of operation. The U.S. Small Business Administration (SBA) has developed size standards to carry out the purposes of the Small Business Act, and those size standards can be found in 13 CFR 121.201. The size standards are matched to North American Industry Classification System (NAICS) industries. The SBA definition of a small business applies to a firm's parent company and all affiliates as a single entity.

ii. **Small Governmental Jurisdiction.** Section 601(5) defines small governmental jurisdictions as governments of cities, counties, towns, townships, villages, school districts, or special districts with a population of less than 50,000. Special districts may include those servicing irrigation, ports, parks and recreation, sanitation, drainage, soil and water conservation, road assessment, etc. Most tribal governments will also meet this standard. When counties have populations greater than 50,000, those municipalities of fewer than 50,000 can be identified using population reports.

Other types of small government entities are not as easily identified under this standard, as they are not typically classified by population.

iii. **Small Organization.** Section 601(4) defines a small organization as any not-for-profit enterprise that is independently owned and operated and not dominant in its field. Small organizations may include private hospitals, educational institutions, irrigation districts, public utilities, agricultural co-ops, etc. Depending upon state laws, it may be difficult to distinguish whether a small entity is a government or non-profit entity. For example, a water supply entity may be a cooperative owned by its members in one case and in another a publicly chartered small government with the assets owned publicly and officers elected at the same elections as other public officials.

Description of Economic Activities for which Impacts are Most Likely

Any activity conducted by a small entity that affects the habitat or habitat features essential to the leatherback sea turtle has the potential to be affected by the proposed critical habitat designation. As described in the main text of this analysis, NMFS identified 8 categories of economic activity as potentially requiring modification to avoid destruction or adverse modification of the leatherback sea turtle critical habitat. These "activities" include the operation of some facilities, such as water temperature controls, where special management of operations may be required for the leatherback sea turtle. The following are the economic activities assessed in this IRFA:

i. NPDES permit activities
ii. Agricultural Pesticides
iii. Oil spills
iv. Power plants
v. Desalination plants
vi. Tidal/wave energy projects
vii. Liquefied natural gas (LNG) projects
viii. Aquaculture

As discussed earlier in this report, a great deal of uncertainty exists with regard to how potentially regulated entities will attempt to avoid the destruction or adverse modification of critical habitat. This is because relatively little data exist on the effects to leatherback sea turtles and their prey from aspects of the activities identified (i.e. water quality, water temperature, etc.) In addition, while baseline protections are expected to be afforded due to current listing-related conservation measures, the economic analysis estimates the incremental impacts resulting specifically from the proposed critical habitat designation.

This IRFA estimates the potential number of small businesses that may be affected by this rule, and the average annualized impact per entity for a given area and activity type. Specifically, based on an examination of the North American Industry Classification System (NAICS), this analysis classifies the potentially affected economic activities into industry sectors and provides an estimate of the number of small businesses affected in each sector based on the applicable NAICS codes. Table E-1 presents a list of the major relevant activities and descriptions of the industry sectors involved in those activities, including NAICS codes, and the SBA thresholds for determining whether a business is small.

This IRFA does not consider all types of small businesses that could be affected by the proposed critical habitat designation due to lack of information.

Impacts to small businesses involved in the remaining 6 activities are discussed below.

Table E-1 : Major Relevant Activities and a Description of the Industry Sectors Engaged in those Activities

Activity	Description of included industry sectors	NAICS code	SBA size standard
NPDES	**Water Supply and Irrigation Systems** This industry comprises establishments primarily engaged in operating water treatment plants and/or operating water supply systems. The water supply system may include pumping stations, aqueducts, and/or distribution mains. The water may be used for drinking, irrigation, or other uses.	221310	$7.0 million average annual receipts
	Sewage Treatment Facilities This industry comprises establishments primarily engaged in operating sewer systems or sewage treatment facilities that collect, treat, and dispose of waste.	221320	$7.0 million average annual receipts
	Food Manufacturing Industries in this sector transform livestock and agricultural products into products for intermediate or final consumption. The industry groups are distinguished by the raw materials (generally of animal or vegetable origin) processed into food products.	311	500 employees
	Wood Product Manufacturing Industries in this sector manufacture wood products, such as lumber, plywood, veneers, wood containers, wood flooring, wood trusses, manufactured homes (i.e., mobile home), and prefabricated wood buildings.	321	500 employees
	Paper and Pulp Mills This industry comprises establishments primarily engaged in manufacturing paper and/or pulp.	322	750 employees
Agricultural Pesticides	**Farm Supplies Merchant Wholesalers** This industry comprises establishments primarily engaged in the merchant wholesale distribution of farm supplies, such as animal feeds, fertilizers, agricultural chemicals, pesticides, plant seeds, and plant bulbs.	424910	100 employees
Oil Spills	**Deep Sea, Coastal, and Great Lakes Water Transportation** This industry comprises establishments primarily engaged in providing deep sea, coastal, Great Lakes, and St. Lawrence Seaway water transportation. Marine transportation establishments using the facilities of the St. Lawrence Seaway Authority Commission are considered to be using the Great Lakes Water Transportation System.	48311	500 employees
	Marinas This industry comprises establishments, commonly known as marinas, engaged in operating docking and/or storage facilities for pleasure craft owners, with or without one or more related activities, such as retailing fuel and marine supplies; and repairing, maintaining, or renting pleasure boats.	713930	$7.0 million average annual receipts
Power Plants	**Fossil Fuel Electric Power Generation** This U.S. industry comprises establishments primarily engaged in operating fossil fuel powered electric power generation facilities. These facilities use fossil fuels, such as coal, oil, or gas, in internal combustion or combustion turbine conventional steam process to produce electric energy. The electric energy produced in these establishments is provided to electric power transmission systems or to electric power distribution systems.	221112	4 million megawatts for the preceding year[1]
	Nuclear Electric Power Generation This U.S. industry comprises establishments primarily engaged in operating nuclear electric power generation facilities. These facilities use nuclear power to produce electric energy. The electric energy produced in these	221113	4 million megawatts for the preceding

Activity	Description of included industry sectors	NAICS code	SBA size standard
	establishments is provided to electric power transmission systems or to electric power distribution systems.		year1
	Other Electric Power Generation This U.S. industry comprises establishments primarily engaged in operating electric power generation facilities (except hydroelectric, fossil fuel, nuclear). These facilities convert other forms of energy, such as solar, wind, or tidal power, into electrical energy. The electric energy produced in these establishments is provided to electric power transmission systems or to electric power distribution systems.	221119	4 million megawatts for the preceding year1
	Electric Power Transmission, Control, and Distribution This industry comprises establishments primarily engaged in operating electric power transmission systems, controlling (i.e., regulating voltages) the transmission of electricity, and/or distributing electricity. The transmission system includes lines and transformer stations. These establishments arrange, facilitate, or coordinate the transmission of electricity from the generating source to the distribution centers, other electric utilities, or final consumers. The distribution system consists of lines, poles, meters, and wiring that deliver the electricity to final consumers.	22112	4 million megawatts for the preceding year1
Tidal & Wave	**Hydroelectric Power Generation** This U.S. industry comprises establishments primarily engaged in operating hydroelectric power generation facilities. These facilities use water power to drive a turbine and produce electric energy. The electric energy produced in these establishments is provided to electric power transmission systems or to electric power distribution systems.	221111	4 million megawatts for the preceding year1
LNG	**Natural Gas Liquid Extraction** This U.S. industry comprises establishments primarily engaged in the recovery of liquid hydrocarbons from oil and gas field gases. Establishments primarily engaged in sulfur recovery from natural gas are included in this industry.	211112	500 employees

Note:
(1) All entities in the Electric Services Sectors are assumed to be small entities. Consequently, the number for small entities in these sectors represents an upper bound estimate. The number of small entities in the hydroelectric power generation and electrical services industries is unknown because of the unavailability of data related to small business thresholds. For both of these industry sectors the SBA defines a firm as "small" if, including its affiliates, it is primarily engaged in the generation, transmission, and/or distribution of electric energy for sale, and its total electric output for the preceding fiscal year did not exceed 4 million megawatt hours. It was not possible to locate a source that provides this information for all regulated entities within these sectors.
Sources:
Definitions complied from U.S. Census Bureau. North American Industry Classification System (NAICS). Accessed at: http://www.census.gov/cgi-bin/sssd/naics/naicsrch?chart=2007; SBA size standards complied from U.S. Small Business Administration. Table of Small Business Size Standards Matched to North American Industry Classification System Codes. Accessed at:
http://www.sba.gov/idc/groups/public/documents/sba_homepage/serv_sstd_tablepdf.pdf.

ESTIMATE OF THE NUMBER OF SMALL ENTITIES TO WHICH THE RULE WILL APPLY

Approach for Estimating the Number of Small Entities

The specific areas considered for designation of critical habitat, and hence the action area for this rule, spans from Northern Washington to Southern California. NMFS defined the potential critical habitat areas in Section 1 and identified activities in Section 2, both water and land based, that could be affected by the designation. Although the proposed critical habitat areas include marine areas off the coast, the small business analysis is focused on land based areas, which is consistent with Section 2, where most economic activities occur and which could be affected by the designation.

Ideally, this analysis would directly identify the number of small entities that are located within the coastal areas adjacent to the proposed designated critical habitat areas. However, it is not possible to directly determine the number of firms in each industry sector within these areas because business activity data is maintained at the county level. Therefore, this analysis provides a maximum number of small businesses that could be affected. This number is most likely inflated since all of the identified small businesses are unlikely to be located in close proximity of the critical habitat areas.

After determining the number of small entities, this analysis estimates the impact per entity for each area and industry sector. The following steps were used to provide these estimates:

- Total impact for every area and activity type is determined based on the results presented earlier in this report (see Executive Summary);
- The proportion of businesses that are small is calculated for every area for every activity type;
- The impact to small businesses for every area and activity type is estimated by multiplying the total impacts estimated for all businesses with the proportion of businesses that are determined to be small;
- The average impact per small businesses is estimated by taking the ratio of the total estimated impacts to the total number of small businesses.

Discussion of Results

The twenty-six counties that make up the West Coast and may be affected by leatherback sea turtle critical habitat designation represent a range of urban and rural environments. The list of counties, industry sectors (identified by NAICS codes), and the SBA-specified small business size thresholds was

used to search the U.S. Census Bureau database.[47] The states of Washington, Oregon, and California respectively include 4, 7, and 15 of these counties. An estimate of the total number of small entities that could be potentially affected by the designation is summarized in Tables C-2, C-3a, C-3b, C-3c, and C-4.

Demographic Data

Table E-2 shows the socioeconomic profile of the applicable West Coast Counties. Los Angeles County is the most populous county of the twenty-six with a population of nearly 10 million in 2006, representing about 27.3 percent of the population of California. Orange County has the second largest population of the twenty-six counties, with a little over 3 million people in 2006. Orange County contained 8.2 percent of California's population. Pacific and Curry Counties have the smallest populations of the twenty-six counties with 21,735 and 22,358 people, respectively, in 2006.

The populations in all West Coast Counties in the states of Washington and Oregon, and most of the counties in California have been growing. Between 2000 and 2006, the largest growth has been in Jefferson County where population increased 11.3 percent. San Francisco, Santa Cruz, and San Mateo Counties were the only counties to have negative growths between 2000 and 2006. Their growth rates were -4.2, -2.3, and -0.2 percent, respectively.

Median per capita income in 18 of the 26 counties is lower than median per capita income for their respective state. The poverty rate in thirteen of the twenty-six counties exceeds the poverty rate of their respective state. In Del Norte County, the poverty rate is the highest among the twenty-six counties with 19.2 percent of residents below the poverty threshold.

Thirteen of these counties are more densely populated compared to the statewide population density. Notice that San Francisco County has a large population density of nearly 1,000 people per square mile, but only holds 2 percent of the population of California. In short, the counties bordering critical habitat for the leatherbacks range from rural, lightly populated counties with as few as 13 persons per square mile to urban, heavily populated counties with as many as 1,000 persons per square mile. The spectrum of economic welfare across the twenty-six counties is equally diverse encompassing counties with median

[47] NAICS codes can be accessed from the US Census Bureau website: http://www.census.gov/epcd/www/naics.html; and the U.S. Census Bureau. *Number of Firms, Number of Establishments, Employment, Annual Payroll, and Receipts by Receipt Size of the Enterprise for the United States, All Industries -2002*. Accessed at: http://www2.census.gov/csd/susb/2002/usalli_r02.xls.

per capita income of about 14,000 in Del Norte County to Marin County with per capita income over $44,000.

Table E-2: Socioeconomic profile of counties bordering potential leatherback critical habitat

Area	State	County	Population (2006)	% of Statewide Population	% Change (2000-2006)	Per Capita Income (1999)	Poverty Rate (2004)	Population Density (persons/sq mi)
1	California	Sonoma	466,891	1.30%	1.80%	25,724	8.40%	291
1	California	Marin	248,742	0.70%	0.60%	44,962	7.00%	475.6
1	California	San Francisco	744,041	2.00%	-4.20%	34,556	11.60%	9,999.90
1	California	San Mateo	705,499	1.90%	-0.20%	36,045	6.60%	1,575.00
1	California	Santa Cruz	249,705	0.70%	-2.30%	26,396	10.80%	574.4
1&7	California	Monterey	410,206	1.10%	2.10%	20,165	12.90%	120.9
2	Washington	Clallam	70,400	1.10%	9.70%	19,517	12.30%	37.1
2	Washington	Jefferson	29,279	0.50%	11.30%	22,211	10.90%	14.3
2	Washington	Grays Harbor	71,587	1.10%	6.50%	16,799	15.80%	35.1
2	Washington	Pacific	21,735	0.30%	3.60%	17,322	14.50%	22.5
2	Oregon	Clatsop	37,315	1.00%	4.70%	19,515	13.00%	43.1
2	Oregon	Tillamook	25,380	0.70%	4.60%	19,052	12.90%	22
2	Oregon	Lincoln	46,199	1.20%	3.90%	18,692	15.30%	45.4
2	Oregon	Lane	337,870	9.10%	4.60%	19,681	14.90%	70.9
2 &3	Oregon	Douglas	105,117	2.80%	4.70%	16,581	15.00%	19.9
3	Oregon	Coos	64,820	1.80%	3.20%	17,547	16.00%	39.2
3	Oregon	Curry	22,358	0.60%	5.80%	18,138	13.00%	13
3	California	Del Norte	28,893	0.10%	5.00%	14,573	19.20%	27.3
3	California	Humboldt	128,330	0.40%	1.40%	17,203	15.40%	35.4
3	California	Mendocino	88,109	0.20%	2.10%	19,443	14.40%	24.6
7	California	San Luis Obispo	257,005	0.70%	4.20%	21,864	10.40%	74.7
7	California	Santa Barbara	400,335	1.10%	0.20%	23,059	12.50%	145.9
7	California	Ventura	799,720	2.20%	6.20%	24,600	9.30%	408.2
7	California	Los Angeles	9,948,081	27.30%	4.50%	20,683	16.70%	2,344.10
8	California	Orange	3,002,048	8.20%	5.50%	25,826	10.20%	3,607.50
8	California	San Diego	2,941,454	8.10%	4.50%	22,926	10.90%	670

Source: U.S. Census Bureau. *State and County QuickFacts, Census 2006*. Accessed at: http://quickfacts.census.gov/qfd on July 2008.

Small Business Analysis

Tables E-3a, E-3b, and E-3c present the distribution of small businesses by area and by county for businesses with employee, revenue, and capacity constraints, respectively. There is a maximum of 3,458

small businesses involved in activities most likely to be affected by the proposed rule.[48] Of these small businesses, 3,022 (87 percent) are located in California, 301 in Oregon (9 percent), and 134 (4 percent) in Washington. Thus, a majority of the impacts is expected to be concentrated in California. Los Angeles County in California has the maximum number (1,853) of the estimated small affected businesses. Lane County in Oregon and Sonoma, San Francisco, San Mateo, and Ventura counties of California contain about 140 or more small businesses that may be affected by this rule.

[48] This is based on the assumption that all small businesses counted across units and activity types are separate entities. However, it is likely that a particular small business may appear multiple times as being affected by conservation measures for multiple units and activity types. Hence, total small business estimates across units and activity types are likely to be overestimated.

Table E-3a: Estimated Number of Regulated Entities that are Small, with Employee Constraints (by area, county, and activity type)

Max. # of employees to be considered small:		500	500	500	750	100	500
Area	**NAICS Code – Category (Activity)**	211112 – Natural Gas Liquid Extraction (LNG)	311 – Food Manufacturing (NPDES)	321 – Wood Product Manufacturing (NPDES)	322 – Paper and Pulp Mills (NPDES)	424910 –Farm Supplies Merchant Wholesalers (Agricultural Pesticides)	48311 – Deep Sea, Coastal, and Great Lakes Water Transportation (Oil Spills)
2	Clallam	0	3	20	1	2	1
2	Jefferson	0	5	2	1	0	2
2	Grays Harbor	0	9	36	4	0	2
2	Pacific	0	15	6	0	1	0
2	Clatsop	0	17	3	0	0	1
2	Tillamook	0	8	5	1	1	0
2	Lincoln	0	11	5	1	1	0
2	Lane	0	52	77	5	11	0
2&3	Douglas	0	5	34	1	0	0
3	Coos	0	11	19	0	0	3
3	Curry	0	1	5	0	1	0
3	Del Norte	0	2	3	0	0	0
3	Humboldt	0	23	27	1	3	0
3	Mendocino	0	10	21	0	4	0
1	Sonoma	N/A	82	40	1	10	1
1	Marin	N/A	26	11	1	4	2
1	San Francisco	N/A	116	11	6	7	4
1	San Mateo	N/A	91	11	11	3	2
1	Santa Cruz	N/A	41	13	1	5	0
1&7	Monterey	0	70	10	4	25	1
7	San Luis Obispo	1	27	3	3	8	0
7	Santa Barbara	1	30	17	1	20	0
7	Ventura	1	53	14	11	17	2
7	Los Angeles	5	1,080	272	190	56	48
8	Orange	1	N/A	N/A	N/A	N/A	14
8	San Diego	0	N/A	N/A	N/A	N/A	10
	Total	9	1,788	665	244	179	93

Table E-3b: Estimated Number of Regulated Entities that are Small, with Revenue Constraints (by area, county, and activity type)

Max. amount of revenue to be considered small:		$7.0 million	$7.0 million	$7.0 million
Area	**NAICS Code – Category (Activity)**	221310 –Water Supply and Irrigation Systems (NPDES)	221320 –Sewage Treatment Plant (NPDES)	713930 –Marinas (Oil Spills)
2	Clallam	9	0	2
2	Jefferson	3	2	4
2	Grays Harbor	2	0	0
2	Pacific	3	0	0
2	Clatsop	6	0	0
2	Tillamook	2	0	2
2	Lincoln	1	0	0
2	Lane	3	1	2
2&3	Douglas	3	0	0
3	Coos	0	0	2
3	Curry	1	0	0
3	Del Norte	0	0	2
3	Humboldt	7	0	1
3	Mendocino	3	0	0
1	Sonoma	11	0	2
1	Marin	2	0	11
1	San Francisco	2	0	4
1	San Mateo	10	2	6
1	Santa Cruz	4	0	1
1&7	Monterey	12	1	3
7	San Luis Obispo	13	0	3
7	Santa Barbara	7	0	2
7	Ventura	27	2	11
7	Los Angeles	71	4	45
8	Orange	N/A	N/A	16
8	San Diego	N/A	N/A	33
	Total	200	11	149

Table E-3c: Estimated Number of Regulated Entities that are Small, with Capacity Constraints (by area, county, and activity type)

Max. amount of capacity to be considered small:		4 million megawatts for the preceding year[1]	4 million megawatts for the preceding year[1]	4 million megawatts for the preceding year[1]	4 million megawatts for the preceding year[1]	4 million megawatts for the preceding year[1]
Area	**NAICS Code – Category (Activity)**	221111 – Hydroelectric Power Generation (Tidal & Wave)	221112 – Fossil Fuel Electric Power Generation (Power Plants)	221113 – Nuclear Electric Power Generation (Power Plants)	221119 – Other Electric Power Generation (Power Plants)	22112 – Electric Power Transmission, Control, and Distribution (Power Plants)
2	Clallam	N/A	N/A	N/A	N/A	N/A
2	Jefferson	N/A	N/A	N/A	N/A	N/A
2	Grays Harbor	N/A	N/A	N/A	N/A	N/A
2	Pacific	N/A	N/A	N/A	N/A	N/A
2	Clatsop	N/A	N/A	N/A	N/A	N/A
2	Tillamook	N/A	N/A	N/A	N/A	N/A
2	Lincoln	N/A	N/A	N/A	N/A	N/A
2	Lane	N/A	N/A	N/A	N/A	N/A
2&3	Douglas	0	N/A	N/A	N/A	N/A
3	Coos	0	N/A	N/A	N/A	N/A
3	Curry	0	N/A	N/A	N/A	N/A
3	Del Norte	0	N/A	N/A	N/A	N/A
3	Humboldt	0	N/A	N/A	N/A	N/A
3	Mendocino	1	N/A	N/A	N/A	N/A
1	Sonoma	0	0	0	0	1
1	Marin	0	0	0	2	1
1	San Francisco	0	0	0	0	5
1	San Mateo	0	0	0	0	2
1	Santa Cruz	0	1	0	0	1
1&7	Monterey	2	2	0	0	2
7	San Luis Obispo	0	1	0	1	1
7	Santa Barbara	0	0	0	0	2
7	Ventura	0	0	0	2	9
7	Los Angeles	2	10	2	8	61
8	Orange	N/A	N/A	N/A	N/A	N/A
8	San Diego	N/A	N/A	N/A	N/A	N/A
	Total	5	14	2	13	85

Table E-4 sums the information displayed in Tables E-3a, E-3b, and E-3c, and presents the total number of small businesses by area. The study area for Area 7 contains a maximum of 2,208 potentially affected small entities. Efforts associated with Areas 1 and 2 are expected to impact a maximum of 632 and 371 small entities, respectively. Area 3 is the fourth highest impact generating area and is expected to potentially affect 172 small entities. Areas 4, 5, and 6 have no impacts to small entities.

Small businesses receiving National Pollutant Discharge Elimination System (NPDES) permits represent the largest number (2,908) of the potentially affected small entities. This group includes the manufacturing sector (e.g., food processing facilities, paper and pulp mills or sewage treatment plants). Another 242 and 179 small businesses involved in oil spills and agricultural pesticide use, respectively, are also expected to be affected by the proposed rule. Thus, water quality concerns are expected to be the reason that 96 percent of the small entities will be affected. As identified in the proposed rule, States and the Environmental Protection Agency (EPA) have already established acceptable levels of contaminants in waterways. Entities are already required to obtain the National Pollutant Discharge Elimination System (NPDES) permits to discharge contaminants. In cases where NPDES permits are not required, monitoring and compliance with the clean water standards set by the EPA and the States may be required to avoid the destruction or adverse modification of critical habitat for leatherback sea turtle.

Table E-4 : Estimated Number of Regulated Entities Classified as Small (by area and activity)

Area	NPDES[1]	Ag/Pest	Oil Spills[2]	Power Plant	Tidal & Wave Energy	LNG	Total
1	541	42	34	15	1		632
2	340	16	16			0	371
3	155	8	8		1	0	172
4			0				0
5			0				0
6			0				0
7	1,873	114	112	99	3	8	2,208
8			73			1	74
Total	2,908	179	242	114	5	9	3,458

[1] Note that due to lack of county revenue data, national data was used to attribute percentages of small businesses. Source: U.S. Census Bureau. *Number of Firms, Number of Establishments, Employment, Annual Payroll, and Receipts by Receipt Size of the Enterprise for the United States, All Industries -2002*. Accessed at: http://www2.census.gov/csd/susb/2002/usalli_r02.xls.

[2] Ibid.

Table E-5 estimates for every activity type the proportion of businesses that are small within an area. As can be seen, the proportion of businesses that are small in most areas and for most activity types are above 97 percent. Thus, the considered activity types, most businesses in the study area can be considered to be small.

Table E-5 : Percentage of Businesses that are Classified as Small (by area and activity type)

Area	NPDES[1]	Ag/Pest	Oil Spills	Power Plant	Tidal & Wave Energy	LNG	Total
1	99%	100%	98%	100%	100%		99%
2	99%	100%	98%			N/A*	99%
3	99%	100%	98%		100%	N/A*	99%
4			N/A*				N/A*
5			N/A*				N/A*
6			N/A*				N/A*
7	99%	97%	97%	100%	100%	100%	99%
8			98%			100%	98%
Total	99%	98%	98%	100%	100%	100%	99%

[1] Note that the number of small businesses for NAICS code 221320 is too small to have any impact on the total percentage of NPDES businesses classified as small.
* N/A - there are no entities classified as small in the respective areas and activities.

Table E-6 combines information from Tables E-4 and E-5, and annualized cost estimates from previous sections of this report to generate for every area and activity type the potential annualized impact to a typical small business. As explained above, this estimate is generated by taking the ratio of total business impacts, and the total number of small businesses estimated, multiplied by the proportion of businesses that are small, as presented in Table E-4.

As discussed above based on information from Table E-4, Area 7 would be most heavily impacted, if the criteria selected was the total number of small businesses. However, as Table E-6 indicates, if per small entity annualized impacts are considered, Area 3 would be affected most heavily with potential costs as high as $577,700 (assuming higher end impacts, <5 mile buffers where applicable), followed by Areas 1, 7, and 2, with costs of about $221,200, $68,600, and $61,400, respectively.

Table E-6 : Estimated Annualized Impacts per Small Entity by area and activity type

Area	NPDES: Minor		NPDES: Major		Ag/Pest		Oil Spills	Power Plant	Tidal/Wave Energy	Total
	<1	<5	<1	<5	<1	<5				
1	$0	$0	$500	$600	$18,600	$71,000	$13,100	$1,300	$135,200	$221,200
2	$0	$0	$600	$1,900	$5,500	$30,800	$28,700			$61,400
3	$25	$25	$1,200	$2,000	$52,400	$281,800	$57,300		$236,600	$577,725
4							N/A			N/A
5							N/A			N/A
6							N/A			N/A
7	$0	$0	$400	$500	$16,100	$52,800	$2,800	$1,200	$11,300	$68,600
8							$600			$600
Total	$25	$25	$2,700	$5,000	$92,600	$436,400	$102,500	$2,500	$383,100	$929,525

Evaluation of Alternatives

In accordance with the requirements of the RFA (as amended by SBREFA, 1996) this analysis considered various alternatives to the critical habitat designation for the leatherback. The alternative of not designating critical habitat for the leatherback was considered and rejected because such an approach does not meet the legal requirements of the ESA. Although the benefits of exclusion for particular areas appear to outweigh the benefits of designation, NMFS is considering the alternative of designating all potential critical habitat areas (i.e., no areas excluded), and will evaluate comments received. Should NMFS determine to exercise its discretion to designate all areas, the Final Regulatory Flexibility Analysis will address the appropriate impacts.

An alternative to designating critical habitat within all 8 areas is the designation of critical habitat within a subset of these areas. This approach would help to reduce the number of small businesses potentially affected. The extent to which the economic impact to small entities would be reduced depends on how many, and which areas would be excluded. It is estimated that the currently proposed exclusions will result in a reduction in annualized impacts of about $578,300.

APPENDIX F: ENERGY IMPACTS ANALYSIS

Introduction

Pursuant to Executive Order No. 13211, "Actions Concerning Regulations that Significantly Affect Energy Supply, Distribution, or Use," issued May 18, 2001, Federal agencies must prepare and submit a "Statement of Energy Effect" for all "significant energy actions." The purpose of this requirement is to ensure that all Federal agencies "appropriately weight and consider the effects of the Federal Government's regulations on the supply, distribution, and use of energy."[49]

The Office of Management and Budget provides guidance for implementing this Executive Order, outlining nine outcomes that may constitute "a significant adverse effect" when compared with the regulatory action under consideration:

- Reductions in crude oil supply in excess of 10,000 barrels per day (bbls);
- Reductions in fuel production in excess of 4,000 barrels per day;
- Reductions in coal production in excess of 5 million tons per year;
- Reductions in natural gas production in excess of 25 million Mcf per year;
- Reductions in electricity production in excess of 1 billion kilowatts-hours per year or in excess of 500 megawatts of installed capacity;
- Increases in energy use required by the regulatory action that exceed the thresholds above;
- Increases in the cost of energy production in excess of one percent;
- Increases in the cost of energy distribution in excess of one percent; or
- Other similarly adverse outcomes.[50]

Of these, the most relevant criteria to this analysis are potential changes in natural gas and electricity production, as well as changes in the cost of energy production. Possible energy impacts may occur as the result of requested project modifications to power plants, tidal and wave energy projects and LNG facilities. The following sections describe the potential for these impacts in greater detail.

[49] Memorandum For Heads of Executive Department Agencies, and Independent Regulatory Agencies, Guidance for Implementing E.O. 13211, M-01-27, Office of Management and Budget, July 13, 2001, http://www.whitehouse.gov/omb/memoranda/m01-27.html.
[50] Ibid.

Power Plants

As discussed in Section 2.4, there are currently seven power plants located within areas that could be affected by leatherback critical habitat. Out of the seven power plants, one is a nuclear power plant. Descriptions of each power plant can be found in section 2.4.2. Future management and required project modifications for leatherback critical habitat related to power plants include: cooling of thermal effluent before release to the environment, treatment of any contaminated waste materials and modifications associated with permits issued under NPDES.

These modifications could affect energy production; however, the potential impact of possible leatherback conservation efforts on the project's energy production and the associated cost is unknown.

As shown in Table F-1, power plants within the study area have a combined production capacity of 10,227 megawatts and therefore, if about half of this capacity is affected by leatherback critical habitat, it would be higher than the 500 megawatts of installed capacity threshold. It is unlikely that any project modifications would have a large impact on the amount of electricity produced. It is more likely that any additional cost of leatherback conservation efforts would be passed on to the consumer in the form of slightly higher energy prices. Without information about the effect of power plants on future electricity prices and more specific information about how recommended conservation measures for leatherback would effect electricity production, this analysis is unable to forecast potential energy impacts resulting from changes to power plants.

Table F-1: Summary of Capacity of Power Plants

Area	Estimated number of affected power plants	Capacity (MW)
1	Moss Landing Power Plant	2,590
7	Morro Bay Power Plant	1,030
7	Reliant Energy Mandalay Generating Station	577
7	Reliant Energy Ormond Beach Generating Station	1,500
7	El Segundo Generating Station	1,020
7	Redondo Beach Generating Station	1,310
7	Diablo Canyon Power Plant	2,200
Total Capacity		**10,227**

Tidal/Wave Energy Projects

As discussed in Section 2.6, the number of future tidal and wave energy projects that will be constructed within critical habitat is unknown. Currently there are no actively-generating wave or tidal energy projects located within the study area. However, as described in Section 2.6, 8 projects have received preliminary permits from the Federal Energy Regulatory Commission (FERC) and 4 projects have pending preliminary permits[51]

Future management and required project modifications for leatherback critical habitat related to tidal and wave energy projects are uncertain and could vary widely in scope from project to project. Moreover, because the proposed projects are still in the preliminary stages, the potential impact of possible leatherback conservation efforts on the project's energy production and the associated cost of that energy are unclear.

As shown in Table F-2, proposed tidal and wave energy projects within the study area have a combined production capacity of 515 megawatts. If the potential cost of leatherback conservation results in *all* projects not being constructed, then reductions in electricity production in excess of the 500 megawatts of installed capacity threshold are possible. However, this represents a worst case scenario.

It is more likely that any additional cost of leatherback conservation efforts would be passed on to the consumer in the form of slightly higher energy prices. That said, any increase in energy prices as a result of leatherback conservation would have to be balanced against changes in energy price caused by the development of these projects. That is, the construction of tidal and wave energy projects may result in a general reduction in energy prices in affected areas. Without information about the effect of the tidal and wave projects on future electricity prices and more specific information about recommended conservation measures for leatherback, this analysis is unable to forecast potential energy impacts resulting from changes to tidal and wave energy projects.

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[51] Federal Energy Regulatory Commission**.** *Issued and Valid Hydrokinetic Projects Preliminary Permit*. Accessed at: http://www.ferc.gov/industries/hydropower/indus-act/hydrokinetics/permits-issued.asp on June 30, 2009; Federal Energy Regulatory Commission. *Pending Hydrokinetic Projects Preliminary Permits*. Accessed at: http://www.ferc.gov/industries/hydropower/indus-act/hydrokinetics/permits-pending.asp on June 30, 2009.

Table F-2: Summary of Capacity at Proposed Tidal/Wave Energy Projects

Area	Project #	Project Name	Classification	Capacity (MW)
Issued Preliminary Permits				
7	P-13052	Green Wave San Luis Obispo Wave Park	Wave	100
3	P-13053	Green Wave Mendocino	Wave	100
3	P-13075	Centerville OPT Wave Energy Park	Wave	Unknown
3	P-12781	Mendocino County WaveConnect	Wave	Unknown
3	P-12779	Humboldt County WaveConnect	Wave	40
3	P-12749	Douglas County	Wave	100
3	P-12749	Coos Bay	Wave	100
3	P-12713	Reedsport OPT Wave Park	Wave	50
Pending Projects				
1	P-13376	Del Mar Landing Project	Wave	5
1	P-13377	Fort Ross South Project	Wave	5
1	P-13378	Fort Ross South Project	Wave	5
1	P-12585-001	San Francisco Bay Tidal Energy Project	Tidal – Current	10
Total Known Capacity				**515**

Source: Federal Energy Regulatory Commission**.** *Issued and Valid Hydrokinetic Projects Preliminary Permit*. Accessed at: http://www.ferc.gov/industries/hydropower/indus-act/hydrokinetics/permits-issued.asp on June 30, 2009; Federal Energy Regulatory Commission. *Pending Hydrokinetic Projects Preliminary Permits*. Accessed at: http://www.ferc.gov/industries/hydropower/indus-act/hydrokinetics/permits-pending.asp on June 30, 2009.

LNG Projects

Similar to tidal and wave energy projects, the number of future LNG projects that will be built within critical habitat is unknown. As described in Section 3.4, many LNG projects are likely to be abandoned during the development stages for reasons unrelated to leatherback critical habitat. In addition, the potential impact of LNG facilities on leatherback habitat remains uncertain, as is the nature of any project modifications that might be requested to mitigate adverse impacts. Because these LNG projects are still in the development stages, the potential impact of possible leatherback conservation efforts on the project's energy production and the associated cost of that energy are unclear.

Proposed LNG terminals within the study area have a combined natural gas production capacity of 7.15 Bcfd or 2.610 billion Mcf per year, which is in excess of the 25 million Mcf per year threshold (see Table F-2). As discussed in Section 3, project modifications may include biological monitoring, spatial restrictions on project installation, and specific measures to prevent or respond to catastrophes.

Out of the project modifications listed above, spatial restrictions on project installation could have effects on energy production. This modification could increase LNG construction costs, which may result in higher natural gas costs. However, the construction of LNG facilities and associated increased energy supplies to consumers aim to generally result in lower energy prices than would have otherwise been expected. Therefore, this analysis is unable to forecast potential energy impacts resulting from changes to LNG projects without specific information about recommended leatherback conservation measures or future forecasts of energy prices that reflect future markets with increased energy supplies from LNG projects.

Table F-3: Summary of Economic Impacts to LNG Projects

Proposed LNG Import Terminals			
Area	**Location**	**Applicant**	**Capacity (Bcfd)**
3	Coos Bay, OR	Jordan Cove Energy Project	1.0
2	Astoria, OR	Oregon LNG	1.5
7	California Offshore, Clearwater Port, near Ventura County	Clearwater Port LLC (Northern Star Natural Gas)	1.4
Potential LNG Import Terminals			
2	St. Helens, OR	Port Westward LNG LLC	0.7
3	Offshore CA	Pacific Gateway – Excelerate Energy	0.6
7	Offshore CA, Port Esperanza near Long Beach	Esperanza Energy, LLC	1.2
8	Offshore CA	Chevron Texaco	0.75
Total Capacity			**7.15**
Sources: FERC, accessed online April 15, 2009 at http://www.ferc.gov/industries/lng/indus-act/terminals/lng-proposed.pdf Updated as of February 6, 2009 FERC, accessed online April 15, 2009 at http://www.ferc.gov/industries/lng/indus-act/terminals/lng-potential.pdf Updated as of February 6, 2009			